Cyfoeth Naturiol Cymru
Natural Resources Wales

Welsh Dune Fungi: Data Collation, Evaluation and Conservation Priorities

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Crynodeb Gweithredol

Mae ffyngau'n hanfodol i greu a chynnal systemau twyni yn y tymor hir, gan helpu i amddiffyn arfordiroedd Cymru rhag llifogydd. Maent yn galluogi planhigion fasgwlaidd i gytrefu mewn twyni trwy gasglu gronynnau tywod a chaniatáu i blanhigion arloesol ymsefydlu a thwyni ffurfio. Mae mwy na 14% o arfordir Cymru yn cynnwys systemau twyni (canran uwch nag yn Lloegr) ac mae'r rhain, ynghyd â glaswelltiroedd heb eu gwella ar dir uchel, yn esgor ar elfen bwysig ac arbennig ym mycota Cymru.

Mae'r amgylchedd cymharol anodd ac eithafol hwn yn cynnal nifer o facroffyngau arbenigol (gyda'r cyrff hadol yn weladwy â'r llygad noeth) na welir mohonynt ond yn anfynych mewn mannau eraill. Eto i gyd, dim ond pump o SoDdGA twyni yng Nghymru sy'n crybwyll ffyngau yn eu dogfennau hysbysu; a hyd yn oed wedyn, dim ond fel 'casgliad o ffyngau' generig heb unrhyw fanylion am y tacsonau na'u hanghenion cadwraeth unigol. Nid oes unrhyw arolwg systematig pellgyrhaeddol o facroffyngau twyni Cymru wedi'i gynnal yn ystod yr ugain mlynedd ddiwethaf, ers i waith arloesol Maurice Rotheroe gael ei gynnal yng nghanol y 1980au a dechrau'r 1990au.

Er mwyn asesu pwysigrwydd cadwraethol twyni o safbwynt macroffyngau, tynnu sylw at fylchau mewn gwybodaeth, a chyflwyno cyngor ynghylch anghenion monitro, mae'r asesiad hwn wedi casglu data o ffynonellau eang gan gynnwys cardiau mynegai, adroddiadau cyhoeddedig a chronfeydd data cenedlaethol, yn ogystal â rhestrau gan unigolion a grwpiau ffyngau sy'n cofnodi yng Nghymru.

Mae bron i 7500 o gofnodion wedi'u coladu, gan gynnwys 845 o facroffyngau y mae 106 o'u plith yn Rhywogaethau o Bryder Cadwraethol. Mae chwech o facroffyngau Adran 42 wedi'u cofnodi ar dwyni: tagell binc fawr las Entoloma bloxamii, seren ddaear gain Geastrum elegans, tafod y ddaear dulas Geoglossum atropurpureum, wystrysen y moresg Hohenbuehelia culmicola, tafod daear melynwyrdd Microglossum olivaceum a hoelion ebod Poronia punctata. Caiff 34 yn ychwaneg o dacsonau nad ydynt yn Rhywogaethau o Bryder Cadwraethol eu hasesu fel ffyngau twyni.

Cynigir dull o werthuso safleoedd o safbwynt ffyngau twyni, yn seiliedig ar gyfanswm y Rhywogaethau o Bryder Cadwraethol a'r ffyngau Twyni ym mhob un. Ar gyfer twyni sy'n cyrraedd neu'n rhagori ar y pump lle y nodir ffyngau yn eu dogfennau hysbysu SoDdGA, dylid eu hystyried fel bod o werth SoDdGA: Aberffraw, Castellmartin, Twyni Crymlyn, Twyni Ogwr, Oxwich, Pentywyn/Talacharn, Pen-bre, Morfa Dyffryn, Morfa Harlech, Stagbwll, Mochras ac Ynyslas.

Mae strategaeth bresennol Cymru ar gyfer gwarchod ffyngau (Woods 2009) yn nodi ei bod yn hanfodol i Lywodraeth Cynulliad Cymru fod â gwybodaeth gynhwysfawr am ddosbarthiad y rhywogaethau, fel y gellir cyfarwyddo asesiadau amgylcheddol. Eto i gyd, annigonol yw'r cofnodion sydd ar gael ar gyfer ffyngau ar gyfer nifer o dwyni, gydag ymweliadau prin, cofnodion ysbeidiol, a dim ymweliadau diweddar. Ar sail hyn, argymhellir y dylid cynnal arolygon ar 30-60% o'r safleoedd, ynghyd ag arolwg systematig o Gymru gyfan, er mwyn llenwi'r bylchau yn yr wybodaeth am facroffyngau twyni. Mae ymchwil folecwlar i dacsonau 'twyni' dirgel nad adwaenir mohonynt, ac a allai fod yn bryder cadwraethol, hefyd yn flaenoriaeth. Mae'r ffaith na cheir RDL ar gyfer macroffyngau yng Nghymru ar hyn o bryd yn un elfen bwysig sy'n rhwystro cynnydd yn y maes.

Yn y dyfodol, efallai y bydd Cymru nid yn unig yn gadarnle yn Ewrop i dacsonau capiau cwyr-glaswelltiroedd, ond hefyd yn gadarnle i ffyngau twyni.

Executive Summary

Fungi are essential to the creation and long-term maintenance of dune systems, helping to protect the coasts of Wales from flooding. They enable vascular plants to colonize dunes by accreting sand grains allowing pioneering plants to establish and dunes to build. Over 14% of the Welsh coastline is comprised of dune systems (a higher percentage than in England) and these, together with upland unimproved grasslands, give rise to a significant and distinctive element in the mycota of Wales.

This relatively hostile and extreme environment supports a number of specialist macrofungi (with fruitbodies visible to the naked eye) that are rarely if ever found elsewhere. Yet only five Welsh dune SSSIs even mention fungi in their notification and then only as a generic 'assemblage of fungi' without any indication of the taxa included or of their individual conservation needs. There has been no wide-ranging systematic survey of Welsh dune macrofungi in the last 20 years since the pioneering work of Maurice Rotheroe in the mid 1980s and early 1990s.

To assess the conservation importance of dunes for macrofungi, highlight gaps in knowledge, and advise on monitoring needs this assessment has gathered data from wide-ranging sources including index cards, published reports, national databases, as well as lists from individuals and fungus groups recording in Wales.

Nearly 7500 records have been collated including 845 macrofungi of which 106 are Species of Conservation Concern (SoCC). There are six Section 42 macrofungi recorded from dunes: big blue pinkgill *Entoloma bloxamii*, elegant earthstar *Geastrum elegans*, dark-purple earthtongue *Geoglossum atropurpureum*, marram oyster *Hohenbuehelia culmicola*, olive earthtongue *Microglossum olivaceum* and nail fungus *Poronia punctata*. An additional 34 non-SoCC taxa are assessed as dune fungi.

A method for evaluating sites for dune fungi is proposed based on total number of SoCC and Dune fungi (S&D) at each. Dunes ranking equally or above the five that currently cite fungi in their SSSI notification should be regarded as of SSSI merit: Aberffraw, Castlemartin, Crymlyn Burrows, Ogmore Down, Oxwich, Pendine/Laugharne, Pembrey, Morfa Dyffryn, Morfa Harlech, Stackpole, Shell Island and Ynyslas.

The current Welsh strategy for conserving fungi (Woods 2009) states that it is essential for the Welsh Assembly Government to have comprehensive species distribution information to inform environmental assessment. Yet many dunes have had less than adequate fungus recording with few visits, casual recording, and no recent visits. On this basis 30–60% of sites need surveys and a systematic Wales-wide survey is recommended to fill recording gaps for dune macrofungi. Molecular research into cryptic unrecognised 'dune' taxa which may prove to be of conservation concern is also a priority. The lack of a current RDL for macrofungi in Wales is a major impediment to progress.

Wales may in future prove to be not only a European stronghold for its waxcap-grassland taxa but also a stronghold for its dune fungi.

1 Introduction

1.1 Aims

The principal aim of this project is to gather data on fungi recorded from Welsh dune systems from as many sources as practical to highlight species of conservation concern (SoCC) recorded at each and to advise on gaps in current recording knowledge. This forms the basis for advising NRW both on how to best survey and monitor sand dune fungi in Wales as a whole and more specifically how to best survey and monitor the Site of Special Scientific Interest (SSSI) feature 'assemblage of dune macrofungi' currently listed from five Welsh dune SSSIs. To achieve this the report includes a wider list of target non-lichenised sand dune macrofungi known from Wales as well as all Welsh SoCC sand dune fungi with their known fruiting ranges in the UK.

The report is accompanied by a Microsoft Excel workbook of all fungi recorded from Welsh sand dunes detailing which are relevant dune macrofungi and a separate worksheet listing records of SoCC fungi. Data sources for each record are also included.

1.2 Role, Importance, and Diversity of Dune Macrofungi

Fungi are not only an important component of sand dune ecosystems, they are essential to the creation and long-term maintenance of such systems, allowing dunes to build and helping to protect the coast from flooding. They enable vascular plants to colonize dunes by providing, through mycorrhizal associations, the phosphorus and nitrogen essential for plant growth. In addition subsurface fungal hyphae accrete sand grains, consolidating ground sufficiently for pioneering plants to establish themselves.

Many of these fungal partners are macrofungi (with fruitbodies easily visible to the naked eye) and include a number of specialist dune species that are rarely if ever found in other habitats. Mycorrhizal microfungi (particularly *Glomus* species) are equally important to dune ecostystems, but are not visible to the naked eye and are seldom recorded associating with species such as marram grass *Ammophila arenaria*. Saprotrophic micro- and macrofungi, recycling dead plant and animal matter, can be found throughout the dune system.

Microfungi dominate the strandline and foredunes, but the first visible macrofungi typically appear with lyme and marram grass in the mobile (yellow) dunes. These include a number of agarics that are obligate saprotrophs of the grasses, such as the dune inkcap *Coprinopsis ammophilae*, the dune cavalier *Melanoleuca cinereifolia*, and the marram oyster *Hohenbuehelia culmicola*. The semi-fixed (grey) dunes support larger numbers of fungal species, including the mushroom *Agaricus devoniensis* and the stalkballs *Tulostoma brumale* and *T. melanocyclum*. But the greatest diversity is found in dune slacks, where ectomycorrhizal macrofungi form associations with plants such as creeping willow *Salix repens* and round-leaved wintergreen *Pyrola rotundifolia* (Vincenot *et al*. 2008). Such associates include the agaric *Hebeloma dunense* and many *Cortinarius* and *Inocybe* spp. In fixed dunes, base-rich grassland may support species such as the dune waxcap *Hygrocybe conicoides* and the limestone waxcap *H. calciphila*, whilst dune scrub may have ectomycorrhizal macrofungi associated with birch and willow as well as

earthstars *Geastrum* spp and saddle fungi *Helvella* spp. Dune woodland (including plantations) on sandy soil may be rich in *Russula* spp and other ectomycorrhizal agarics.

Specialist dune fungi are typically arenicolous, adapted to growing in sand. A few may also be halophilic, salt-loving or at least salt-tolerant. Many (particularly among the gasteroid fungi) are xerophilic, with fruitbodies adapted to dry, open, well-drained conditions which in the British Isles may be restricted to dunes. Many are also calciphilic, favouring base-rich dune soils, especially calcareous dune grassland. Acidic dune heathland (rare in Wales, though known, for example, at Morfa Abererch SSSI, near Pwllheli) is less diverse in macrofungi, having few if any specialist species that are not found in other habitats (Spooner & Roberts 2005). Non-specialist dune fungi may be found elsewhere inland, but many seem to have a preference for dunes and some have not yet been recorded in any other habitat in Wales.

As dunes represent a relatively hostile and more extreme environment for fruiting of larger fungi they tend to support a lower number of species than habitats such as woodland. Yet they do support a specialised range of dune species that are not found in other habitats and may be rarely recorded.

1.3 Importance of Welsh Dune Fungi

As noted by Rotheroe (1993), “there can be few other ecosystems in Wales which provide so rich a list of rare or unusual macrofungal species as do coastal sand dunes...Welsh sand-dune habitats are a refuge for rare and unusual species.”

Over 14% of the Welsh coastline is comprised of dune systems (a higher percentage than in England) and these, together with upland pastures, are a significant and distinctive element in the Welsh mycota.

Five Welsh SSSIs are cited for their assemblage of dune fungi, namely Merthyr Mawr, Gronant Dunes and Talacre Warren, Whiteford Burrows, Kenfig, and Newborough Warren. However no dune SSSI in Wales specifies any of the taxa included in these assemblages or details their individual conservation needs.

The Important Fungus Areas report for the UK (Evans *et al.* 2001) lists nine dunes in Wales with qualifying criteria namely: Crymlyn Burrows, Kenfig, Morfa Harlech, Newborough, Oxwich, Pembrey, Pendine, Whiteford Burrows, and Ynyslas. It further notes three dunes proposed for assessment but in need of further information, namely: Abberffraw, Merthyr Mawr, and Gronant /Talacre.

1.4 Historical Recording of Dune Fungi in Wales

In Wales the main systematic recording of dune macrofungi essentially began with a series of reports by Maurice Rotheroe produced for the Nature Conservancy Council between 1986 and 1991 and the Countryside Council for Wales in 1995. Since this decade of interest, recording at dunes has mainly been more casual with ad hoc recording undertaken by interested individuals, occasional group visits by the British Mycological Society (BMS) and (since their formation in 1996) two or three local fungus-recording groups.

There has been no wide-ranging systematic survey of Welsh dune macrofungi in the last 20 years.

Existing records have varied hugely in type and quality. There have been a number of targeted systematic lists of fungi at dune sites, occasionally with repeat visits in a single year or year-on-year, e.g. by Rotheroe between 1985 and 1995, Aron and others in north Wales, and more recently the Pembrokeshire Fungus Recording Network. There have also been a large number of one-off visits (e.g. by the Glamorgan Fungus Group, the BMS, etc.) where something approaching a site list of all fungi observed has been made. But there have also been many casual records from dune sites where only a single species or a few interesting or seldom-recorded fungi have been noted with no attempt at a systematic site list.

Recorders based on BMS forays have made part- or full-day visits to 12 dunes in Wales: Aberffraw (2011), Crymlyn Burrows (1994), Kenfig (1992), Morfa Dyffryn (2011), Morfa Harlech (2011), Newborough (1988, 2001, 2011), Oxwich (1992, 1994), Pembrey (1994), Poppit Sands (1987), Shell Island (2011), Whiteford Burrows (1992) and Ynyslas (2011).

Skill levels for all these types of visit have also varied widely. On the one hand some Welsh dunes have been visited by national and international experts (including Dutch expert Eef Arnolds and French expert Regis Courtecuisse, both with a special interest in dune macrofungi), who may have restricted their recording to one or more specialist groups; on the other hand, they have also been visited by newcomers just beginning an interest in fungal identification and restricted to what they perceive to be easily identified taxa in popular field guides.

2 Methodology

2.1 Data Sources

Data was gathered from as wide a range of sources as practical in the timeframe and included:

1. Fungal Records Database of Britain and Ireland (FRDBI) managed by the British Mycological Society. This incorporates the keyboarded data from collections held in the Fungarium at the Royal Botanic Gardens, Kew together with records from BMS forays as well as from a UK-wide network of groups and individual fungus recorders.
2. Primary source datasets in a variety of formats from individual mycologists or groups known to be recording fungi from dunes in Wales (see Acknowledgements).
3. Key sources of dune records in Wales only available from literature references and missing from the previous two datasets. As these would require lengthy keyboarding for all the data it was only possible to incorporate species of conservation concern (SoCC) together with dune species within the remit of this project. These included data from reports by Maurice Rotheroe (*Mycoflora of sand-dune systems in Wales*, 1995 and *Ynyslas Fungi Revisited*, 2002) and Bruce Ing (*The fungus flora of Talacre Warren*, undated).

4. Any additional records for SoCC species in Wales from various other sources including: The Association of British Fungus Groups (ABFG) database of records (CATE 2015), Excel spreadsheet of Section 42 (S42) species compiled for Plantlink Cymru (Detheridge 2014), as well as the Royal Botanic Gardens, Kew 'Lost and Found' project (Cannon 2015).

The largest dataset was extracted from the FRDBI using queries based on over 50 combinations of locality names including those of all known dune systems in Wales as well as misspellings and more generic queries such as 'dune', 'burrow', 'link', 'warren', 'down', and 'traeth'.

Significant additional datasets were made available directly from recorders: for North Wales from Charles Aron, Andrew Graham, and Pat O'Reilly; for Pembrokeshire from David Harries; for Glamorgan from the Glamorgan Fungus Group and from the authors of this report.

As the more recent ABFG database of fungi in the UK assimilated all the records from the FRDBI circa 2005, a cross-checking approach for a critical SoCC subset (S42 species) was undertaken which revealed no additional target records in CATE for the last 10 years. This approach avoided complete duplication of the FRDBI dataset to 2005 and any subsequent confusion arising from separate editing.

One of the most significant recorders from sand dunes in Wales was the late Maurice Rotheroe who pioneered and promoted interest in sand-dune fungi in the UK especially in the decade from 1985 to 1995. A number of these records were transferred to the FRDBI and it was his intention to progressively convert his Mac and other records to a suitable format for input to the FRDBI (Rotheroe 1993). Analysis of the FRDBI dataset indicates that this was not done for most of his sand-dune surveys with the exception of BMS forays at Welsh sand dunes, waxcap-grassland surveys undertaken by him under contract to CCW, and survey specimens sent to national fungaria which have been added to FRDBI via their individual databases.

Because of the importance of this dataset and as an addition to this report circa 400 of Maurice Rotheroe's records were keyboarded from his reports (1995 & 2002) and from a number of his specimen index cards relating to dunes which are held by the authors. These included all Species of Conservation Concern (SoCC) (tables 3.1, 3.2, and 3.3) together with all other Welsh dune species (table 3.38).

2.2 Spreadsheet

This report is informed by an Excel workbook (Welsh Dune Fungi 2015) of all the fungus records collated as part of this project detailing information on locality, date, recorder, identifier, data source, SoCC, dune or microfungus status. SoCC fungi are highlighted in red. A separate worksheet for SoCC details similar information, additionally including conservation listing, and highlights S42 species in yellow. A third worksheet lists locality names as listed by the recorder with the standardised name (see 2.3) given for this project.

2.3 Standardising Site Names

A major challenge was rendering the compiled dataset of use as an assessment tool. As nearly 20% of the data lacks meaningful grid references but over 99% does have a locality name, the 'locality as recorded' field was used as the basis of all assessments. The next challenge was to standardise the plethora of name variations used as 'locality' by recorders for the same site. This rises dramatically at the more popular sites mycologists have visited. Morfa Harlech, for example, has 19 variant names, Pembrey 30, and Stackpole 36.

An all-inclusive precautionary approach was taken such that if observations appeared probably or possibly to be recorded from a dune or sandy coastal site then they were included in the database. In particular woodland and scrub at the back or landward side of dune systems were included, e.g. Lligwy Woods at Traeth Lligwy and Stackpole Warren Wood at Stackpole. In addition sandy coastal grassland sites on the periphery of known dune systems were also included, e.g. Ogmore Down. Similarly all fungal taxa were included in the initial spreadsheet, not just macrofungi which were filtered out for later analysis. The resulting database is therefore likely to be 'dirty' and include a few records not strictly from dunes, dune grassland, or dune woodland/scrub, but this does not appreciably affect the analysis of data. Duplicates have not been removed.

All localities were assigned a consistent simple 'dune' name based on site names used by Dargie (1995) and Bosanquet (bryophyte spreadsheet 2015). Where geographically appropriate these were amalgamated into larger contiguous dune areas such as Pembrey and Stackpole (with the exception of Broad Haven which remains separate). Specific recorder information on locality name is retained both in the A-Z site accounts (tables 3.4 to 3.37) and in the Excel database (Welsh Dune Fungi 2015) supporting this report, e.g. Freshwater West includes Broomhill Burrows and Kilpaison Burrows in the north and Brownslade and Linney Burrows in the south.

Where it was unclear from the locality name to which dune system records should be assigned the grid references were checked using an online tool (http://sewhgpgc.co.uk/xc/os2.php).

This cross-checking has not been done for all grid references in the dataset and it should be stressed that for many records the grid references recorded are likely to be localised or centralised or sometimes even reflect the locality of the carpark rather than the precise point where each species was found. This is particularly likely for data collected before the introduction of GPS devices and is still currently likely for most casual recording not undertaken as part of a more rigorous scientific site survey. Because of this locality vagueness it is not possible to clearly define the boundaries of the assigned dune systems. Crosschecks with SSSI boundaries have not been made except in a broad sense such that records obviously outside a SSSI have been assigned a different standardised dune name. Where grid references appear generalised for records on a given day it will only be possible to gain more precise locational information for critical species by contacting the most recent collector.

2.4 Current Names of Dune Fungi

To allow any meaningful numerical comparison of species recorded at each site, a set of standardised names for each taxon was needed. Once keyboarding and assimilation of all records additional to the FRDBI dataset were complete each record was assigned a

‘current name’ in order to standardise the species names being used by recorders, e.g. *Hygrocybe nitiosa* is a synonym of *H. ovina*. For this process 'current' names for basidiomycetes have been based on the ‘Checklist of the British and Irish Basidiomycota’ (Legon & Henrici 2005) and subsequent online updates (http://www.basidiochecklist.info/LatestUpdates.asp) and for ascomycetes follow names used in FRDBI. English names follow the Recommended English Names for Fungi in the UK (Holden *et al.* 2003) and online updates (http://www.britmycolsoc.org.uk/library/english-names/).

Within the FRDBI dataset current names were already assigned but in a few cases updating had not occurred and some taxa did not follow the Checklist so crosschecking of the entire dataset was completed for over 6,500 records of all SoCC and dune macrofungi species. For example *Inocybe halophila* (appearing in FRDBI only from Gronant and Talacre) has been excluded in this assessment since the Checklist notes that the name could apply to a number of species in the *Inocybe impexa* complex. This is supported by the current update to ‘Keys to British *Inocybe*’ (Outen & Cullington 2015). Similarly *Hebeloma kuehneri* and *Melanoleuca leucophylloides* have been excluded from this assessment following doubts expressed in the Checklist, although the names still appear on FRDBI.

One name of particular note is *Hygrocybe olivaceonigra* which is regarded by the Checklist as a synonym of *H. conica* and is treated as such in this assessment. In Boertman (2010) and Harries (2015) however it appears as a separate species although DNA results from the RBG Kew ‘waxtongue’ project (Cannon 2012) suggest that *H. conica* should be regarded as an aggregate taxon with at least seven cryptic species in the UK. Evaluation of UK records of *H. olivaceonigra* in FRDBI do not show it to be mainly from dune sites although it was first described in 1960 from a specimen from Holkham Gap dunes, Norfolk (Orton 1960) and the only Welsh site for it is dunes at Broad Haven (Stackpole). For the purposes of this report it is assessed as part of the *H. conica* aggregate. However it is worth noting that as best practice all atypical collections of *H. conica* or indeed any taxa from dunes and elsewhere should be well described, photographed, and kept as they could be of use in any future DNA analysis to disentangle this and other potential complexes.

There are a number of exceptions where the online Checklist has not been followed as more recent information is likely to supersede current Checklist names. *Inocybe heimiana* has therefore been included in this assessment as Outen & Cullington (2015) consider this to be a good distinct species with material examined from Welsh dunes. So as an incentive to recorders it is included here so that future DNA analysis may confirm this opinion. *Tulostoma fimbriatum* is not yet in the Checklist as it is a new British record, first found in 2011 at Ynyslas.

2.5 Species of Conservation Concern (SoCC) Evaluation

Key lists for fungi of conservation concern in Wales were identified and all the relevant taxa then highlighted to create a separate worksheet of all their records in Wales. Information on typical niche habitat and fruiting range in the UK were then identified for each species based on UK FRDBI records.

Conservation listings were recorded for each species based on the following: Welsh Section 42 species (Anon 2015a), the Rust Fungus Red Data List and Census Catalogue for Wales (Woods *et al.* 2015), the Red List of Fungi for Great Britain: Boletaceae (Ainsworth *et al*. 2013), the Red Data List of Threatened British Fungi (Evans *et al.* 2006), the Candidates for Listing in Appendix 1 of the Bern Convention (Dahlberg & Croneborg 2003), and the revised Red Data List of Welsh Macrofungi (Rotheroe 2003). Where a recorded SoCC taxon is now included in the current Checklist as part of another species concept those records relating to the recorded name are included as a SoCC taxon, e.g. records of *Cortinarius epsomiensis* (in Red Data List of Welsh Macrofungi) are now included within the concept of *C. anomalus.*

It is clear that some of these lists, in particular the revised Red Data List of Welsh Macrofungi, are in need of updating and that certain species would in the light of better recording information/understanding now be unlikely to be included. *Clavulinopsis laeticolor*, *Hygrocybe calciphila*, and *Entoloma prunuloides* are examples of this. However a broad, consistent and precautionary approach in methodology has again been taken in line with site and species selection. That such relatively widespread species are currently red-listed serves also to highlight the need for a new macrofungi Red Data List for Wales.

The SoCC spreadsheet and all site evaluations do, for the sake of completeness, include microfungi which also appear in the database of records. These listings may not be complete, however, since direct source requests for data were largely confined to macrofungi, as per the project brief. An exception was a small dataset of records from Nigel Stringer and Ray Woods for species listed as threatened on the Rust Fungus Red Data List (Woods *et al.* 2015).

2.6 Dune Species Evaluation

There are various sources of information on species of macrofungi typical of dunes in the UK (e.g. Rotheroe 1993, Spooner & Roberts 2005) however these are only partial lists and not necessarily species found mainly in dunes (Rotheroe, for example, lists ubiquitous wood- and grassland fungi such as *Lepista nuda* and *Paxillus involutus* among the commoner sand-dune species).

As an addition to this project brief it was deemed important to produce as full a list of dune species as possible. The intention was to provide a useful tool to inform both future recording and potential fungal evaluation of sand dune systems. This was done by assessing all species of macrofungi from the dataset against sites where each species is recorded in FRDBI. Those species with more than 50% of records from dune sites are deemed to be ‘dune species’. To be as meaningful as possible evaluation is based on the full UK FRDBI dataset rather than Welsh records alone.

It should be noted that the outcome only gives a snapshot of likely habitat preference based on recording data and will change over time as more records become available particularly for under-recorded species. Species concepts too may change based on re-examination of exsiccata and molecular work.

If not already listed as being of conservation concern (table 3.1) dune species are listed in table 3.38, together with all the dune/coastal sites where they have been found plus the year of the most recent record according to this collation. This is the first comprehensive

assessment to produce a list of dune macrofungi and is based on a dataset of just under two million UK records.

2.7 Dune Species in a Welsh Context

Species in Wales recorded mainly from dune sites but which in a UK context are mainly found in other habitats are listed separately in the supporting Excel spreadsheet as 'only in Wales'. One such example is the diminutive ascomycete *Podosordaria tulasnei* found on rabbit droppings, as featured in the West Wales dune leaflet (Harries *et al*. 2015).

The 'only in Wales' workbook assessment comprises circa 90 species most of which are likely to be under-recorded with only a few genuinely rare. A significant number of these have only been recorded from one site in Wales, yet are in many cases more common in the UK as a whole. This strongly demonstrates the need in Wales for many more fungal surveys to be undertaken across a wide range of habitats.

2.8 Quality Control

It should be noted that species identification data has not been subject to any quality control and recorded names for this collation are accepted in good faith. A large number of recorders over a long time period have contributed these records; species concepts may have changed during this time and access to specialist literature improved. Moreover for the majority of records no voucher specimens have been retained to check identification. Retention of voucher specimens would now be regarded as best practice for all critical taxa (new, difficult, or SoCC, etc.) recorded for any systematic scientific survey.

All spreadsheet assessments for type of habitat (whether dune or not) and timing are based on UK FRDBI records and again these are accepted in good faith, as are location data (as previously detailed). There may be slight bias when noting habitat toward recording what is 'normally' accepted for a species rather than all potential associations present. There is also a tendency toward recording in the autumn months (a time suitable for field recorders' favoured habitat of woodland) rather than throughout the year. Recording after periods of significant rainfall and throughout mild winter and spring months is the best approach for dune fungi.

3 Results

3.1 Summary Analysis

The data collation has gathered just under 7500 records from 44 broad standardised dune sites in Wales for 1321 fungal taxa of which just under 6700 records relate to 845 taxa of macrofungi covering 222 genera.

The fungi recorded can be broadly grouped according to their preferred or obligate habitats, not all of which may be present at every dune system.

Macrofungi of mobile or yellow dunes are typically associated with marram grass *Ammophila arenaria* or lyme grass *Leymus arenarius*, usually as saprotrophs growing on

dead roots or on dead stems. The fungi are typically adapted to dry, sandy conditions and may develop fruitbodies which are partly hidden under the sand surface (where they are protected from moisture loss). Species such as the dune inkcap *Coprinopsis ammophilae*, the dune stinkhorn *Phallus hadriani*, and the dune cup *Peziza ammophila* are examples of the macrofungi most likely to be found in this habitat.

In more stable grey dunes with a variety of vascular plants, the number of saprotrophic fungal species increases. Gasteroid fungi, whose sporocarps are adapted to dry conditions, are typical and may include stalkballs *Tulostoma* spp, bird's nest fungi *Cyathus* spp, earthstars *Geastrum* spp, and puffballs, notably the least puffball *Bovista limosa* which appears to be restricted to dunes in the UK. Sand-loving agarics, such as the mushroom *Agaricus devoniensis*, may also be present.

In dune slacks where *Salix repens* is present (or other *Salix* spp), specialist ectomycorrhizal fungi form mutually beneficial associations with willow roots. Such sites can be rich in species of *Cortinarius*, *Hebeloma*, *Inocybe*, *Lactarius*, and *Russula*, all of which produce conspicuous agaricoid (mushroom-shaped) fruitbodies. Macrofungi from these ectomycorrhizal genera also appear in woodland and plantations at the back of dunes, though such climax tree cover is only present at a minority of Welsh dune systems.

Where present, base-rich dune grassland may contain calciphilic species such as the limestone waxcap *Hygrocybe calciphila* and the dune waxcap *H. conicoides*.

There are in addition a number of taxa which are not dune specialists, but are nonetheless most frequently found in this habitat, at least in Wales. The nail fungus *Poronia punctata*, which grows on dry horse dung (see 3.2 below), is just such a species.

3.2 Species of Conservation Concern (SoCC)

There are in total 106 fungal taxa of conservation concern recorded from dunes in Wales.

Six of these are S42 macrofungi, namely: big blue pinkgill *Entoloma bloxamii*, elegant earthstar *Geastrum elegans*, dark-purple earthtongue *Geoglossum atropurpureum*, marram oyster *Hohenbuehelia culmicola*, olive earthtongue *Microglossum olivaceum* and nail fungus *Poronia punctata.* Of these only two are deemed 'dune' species in a UK context: *Geastrum elegans* and *Hohenbuehelia culmicola*.

The marram oyster *Hohenbuehelia culmicola* is of particular note since it is one of the 33 macrofungi species proposed for listing on Appendix 1 of the Bern Convention. As such it is threatened throughout Europe with only 40 localities in eight countries and is not known outside Europe (Dahlberg & Croneborg 2003). The marram oyster is a small agaric with velvety dark brown to blackish cap and eccentric to lateral stipe with contrasting pale gills. It grows at the base and on the stems of marram *Ammophila arenaria* culms. There are five recorded sites for marram oyster in Wales: Freshwater East, Gronant Talacre, Morfa Dyffryn, Pembrey, and Whiteford Burrows. There are a further six sites in England and Scotland, making the UK an important contributor to its known world distribution.

The elegant earthstar *Geastrum elegans* is recorded from two sites in Wales at Aberffraw and Ynyslas. This is a small earthstar with a sessile (not stalked) spore-sac, a conical, plicate peristome (apical opening), and 6-8 arm-like rays. A distinctive feature is that the

rays typically become incurved below the fruitbody. The dwarf earthstar, a commoner species often found in dunes, is very similar but has a short-stalked spore-sac and rays that are rarely if ever incurved.

The nail fungus *Poronia punctata* is a very distinctive S42 species also found only in dunes in Wales. It has been recorded from five sites: Kenfig, Newborough, Oxwich, Pennard Burrows, and Shell Island. The only recent records are from Oxwich and Newborough, however, as it has not been recorded at the other sites for over 80 years. The nail fungus grows on old, dry, weathered horse dung and resembles a broad-headed whitish nail or golf-tee protruding from the dung. The head is dotted with black perithecia from which the spores are released. In the UK as a whole *Poronia punctata* is typically found in non-dune, often heath habitats being dependent entirely on the location of suitable dried pony dung from animals untreated with antiworming medicines.

The remaining three S42 species *Entoloma bloxamii, Geoglossum atropurpureum* and *Microglossum olivaceum* are not dune species as such but waxcap-grassland taxa. They are typical of unimproved grasslands of which dune grassland forms one component. *Entoloma bloxamii* has been recorded at three dune sites: Castlemartin, Ogmore Down, and Stackpole; *Geoglossum atropurpureum* at three sites: Barafundle, Ogmore Down, and Stackpole; and *Microglossum olivaceum* at two sites: Ogmore Down and Oxwich.

Of the 106 taxa of conservation concern recorded from dunes in Wales 16 are macrofungi listed only on the UK Red Data List (Evans *et al.* 2006) while a further 64 taxa only appear on the Welsh Red Data List (Rotheroe 2003).

To better understand this large number of conservation taxa recorded at dune locations a stratified approach has been taken, as detailed in the methodology. All 106 species recorded have been subdivided into three categories: dune species (i.e. species found mainly at dune sites in a UK context), dune species, but only in Wales (i.e. species found mainly at dune sites in Wales but mainly at other sites in a UK context) and non-dune species.

Of these 106 taxa, 21 are deemed to be dune fungi (including five microfungi), 36 are deemed to be dune fungi but only in Wales, and 49 are non-dune species (see tables 3.1, 3.2, and 3.3). Each species is listed with its typical habitat together with the months in which it has been recorded based on recorder observations in the FRDBI with core months in parentheses. The most recent conservation listing for each is also given, as shown in the key below, including whether these species are also listed on the ongoing Kew ‘Lost and Found’ fungi project (KLF) which focuses recording attention on poorly understood taxa:

S42 = species listed in Wales on Section 42 of NERC Act, 2006 (Anon 2015a)
RustWRDL 15 = Rust fungus red data list for Wales (Woods *et al.* 2015)
BritRDL06 = The red data list of threatened British fungi (Evans *et al.* 2006)
Bern = Candidates for listing in Appendix I of the Bern Convention (Dahlberg & Croneborg 2003)
WRDL03 = A revised red data list of Welsh macrofungi (Rotheroe 2003)

Table 3.1. Dune species of conservation concern recorded from dunes in Wales (S42 species in red) (1) = only known Welsh record

Current Name	Typical UK Association	Fruiting Range UK (=core months)	SoCC Listing (most recent)
Ascobolus behnitziensis(1)	sand / bare soil	June (Sept-Oct) Nov	WRDL03
Bovista limosa	sandy soil	Aug (Sept-Nov)	BritRDL06/KLF
Campanella caesia	dead *Ammophila* stems	June (Sept-Nov) Jan	BritRDL06
Chrysomyxa pirolata* (microfungus) *(1)	***Pyrola rotundifolia* var. *maritima***	**Apr-Aug**	**S42/RustWRDL15/KLF**
Coprinopsis ammophilae	mobile dune with *Ammophila*	May (Aug-Nov) Jan	BritRDL06
Cyathus stercoreus	rabbit dung/*Ammophila*	(Sept-Oct)	BritRDL06
Entyloma eryngii (microfungus)	*Eryngium maritimum*	Aug-Nov	BritRDL06
Geastrum elegans	**sandy soil**	**April (Sept-Dec)**	**S42**
Hebeloma dunense	*Salix repens*	May July Sept Nov	WRDL03
Helvella leucopus	sandy soil	April-May	BritRDL06/KLF
Hohenbuehelia culmicola	***Ammophila* at base or on stems**	**Sept (Oct-Jan) Feb**	**S42 /Bern/KLF**
Inocybe arenicola	*Salix (repens)* dune slack	Jul (Aug-Oct) Nov	BritRDL06
Inocybe impexa	*Salix (repens)* dune slack	April (Sept) Oct	WRDL03
Leucoagaricus barssii	soil	April (Aug-Oct)	BritRDL06
Psathyrella flexispora (1)	grass /*Ammophila*	June (Oct-Nov)	WRDL03
Puccinia dioicae var. *schoeleriana* (microfungus)	*Carex arenaria / Senecio sp*	June (Oct-Nov)	RustWRDL15
Puccinia elymi (microfungus)	*Ammophila/Leymus arenarius*	Jul-Dec	RustWRDL15
Puccinia hydrocotyles (microfungus)	various B1 incl. *Hydrocotyle vulgaris*	June (Oct-Nov)	RustWRDL15
Stropharia halophila (1)	*Ammophila*	Aug-Nov	WRDL03
Trichoglossum rasum (1)	sand/moss	Sept	BritRDL06
Tulostoma melanocyclum	**sand/moss (*Tortula*)**	**Jan (Sept-Nov) Dec**	**S42/BritRDL06**

Table 3.2. Dune species (but only in Wales) of conservation concern recorded from dunes in Wales (S42 species in red); (1) = only known Welsh record

Current Name	Typical UK Association	Fruiting Range UK	SoCC Listing
Agrocybe pediades	grass (inc. *Ammophila*)	Jan (May-Aug) Dec	WRDL03
Clitocybe agrestis	grass	July (Oct-Nov) Feb	WRDL03
Conocybe lenticulospora (1)	on dung in grassland	July (Oct-Nov)	WRDL03
Contumyces rosellus	grassland	July (Oct-Dec) Mar	WRDL03
Coprinus sterquilinus	pony dung	Mar (Aug-Nov) Jan	BritRDL06
Cortinarius diabolicus (1)	*Salix/Alnus/Betula*	(Sept-Nov)	WRDL03
Cortinarius fulvosquamosus (1)	*Salix/Betula*	Aug (Sept-Oct)	WRDL03
Cortinarius limonius	*Pinus sylvestris*	July (Aug-Oct) Nov	BritRDL06
Cortinarius mucosus (1)	*Pinus sylvestris*	July (Aug-Oct) Nov	WRDL03
Cortinarius saturninus	mainly *Salix/Betula*	Aug (Sept-Nov) Dec	WRDL03
Dendrocollybia racemosa	decayed fungus fruitbody	(Sept-Oct)	BritRDL06
Entoloma excentricum	base rich grassland	June (Aug-Oct) Nov	BritRDL06
Entoloma sericeum var. *cinereo-opacum*	grassland	Aug (Oct-Nov)	WRDL03
Gamundia striatula	grassland woodland	July (Sept-Nov) Mar	WRDL03
Gyrodon lividus	*Alnus*	July (Aug-Oct)Nov	BritRDL06
Helvella costifera (1)	soil / litter	May (Aug-Sept) Oct	WRDL03
Helvella queletii (1)	damp soil (some with *Salix*)	(Apr-May) June-Sept	WRDL03
Lactarius controversus	mainly *Salix*	Jun (Aug-Nov)	WRDL03
Limacella delicata	base rich woodland	Jul (Aug-Nov) Jan	WRDL03
Limacella guttata	base rich woodland	Aug (Sept-Oct) Nov	WRDL03
Limacella illinita (1)	base rich woodland	(Sept-Nov) Dec	BritRDL06
Lyophyllum gangraenosum	grass/ soil	Jun (Sept-Nov) Dec	WRDL03
Melanoleuca albifolia	grass/ soil	Sept (Oct-Nov)	WRDL03
Morchella elata	base rich soil/litter	Jan (Mar-May) Dec	WRDL03
Melanoleuca schumacheri	sandy soil	Apr (Oct-Nov)	WRDL03
Mycenella salicina	grass/litter	Aug (Nov)	BritRDL06
Naucoria salicetorum	*Alnus/Salix*	May (Oct)	WRDL03
Omphalina galericolor	grass/moss ?base-rich	Jan (Oct-Nov) Dec	BritRDL06
Peziza prosthetica (1)	wet soil	May (Sept-Oct)	WRDL03
Poronia punctata	**untreated horse dung**	**Aug (Sept-Apr) May**	**S42**
Russula laccata	*Salix*	June (Aug-Nov)	WRDL03
Russula lilacea (1)	mixed woods incl *Alnus*	June (Aug-Oct) Nov	BritRDL06
Russula persicina	*Salix*	July (Aug-Oct) Nov	WRDL03
Russula torulosa	conifer plantation	Sept (Oct) Nov	WRDL03
Scutellinia paludicola (1)	soil	Jul-Oct	WRDL03
Stropharia luteonitens	grass/dung	Mar (June-Oct) Nov	WRDL03

Table 3.3. Non-dune species of conservation concern recorded from dunes in Wales (S42 spp in red) (1) = only known Welsh record

Current Name	Typical UK Association	Fruiting Range UK (=core months)	Most recent SoCC Listing
Agaricus comtulus	grass	Jan (Aug-Nov) Dec	WRDL03
Agaricus luteomaculatus (1)	grass or litter	June (Oct-Nov)	WRDL03
Agaricus porphyrhizon	grass or litter	Aug-Nov	WRDL03
Agaricus silvicola	woodland	Jul (Sept-Oct)	WRDL03
Camarophyllopsis micacea	scrub/woodland	Jul (Sept-Nov) Dec	BritRDL06
Camarophyllopsis schulzeri	base rich grassland	May (Aug-Nov) Dec	WRDL03
Chamaemyces fracidus	base rich grass or litter	May (July-Oct) Nov	WRDL03
Clavaria incarnata	base rich grassland	June (Sept-Nov) Dec	BritRDL06
Clavaria straminea	grassland	(Sept-Nov) Dec	BritRDL06
Clavulinopsis laeticolor	grassland	July (Sept-Nov) Jan	WRDL03
Coprinopsis cinereofloccosa (1)	grass	June (Sept-Nov)	WRDL03
Cortinarius anomalus	base rich grassland	Sept (Oct-Nov)	WRDL03
Crepidotus luteolus	fallen wood	Jan (Sept-Dec)	WRDL03
Cyathus striatus	fallen/buried wood	Jan (Aug-Nov) Dec	BritRDL06
Entoloma bloxamii	**base rich grassland**	**June (Aug-Nov) Dec**	**S42 / KLF**
Entoloma catalaunicum	base rich grassland	Aug (Sept-Oct) Nov	BritRDL06
Entoloma exile	grassland	July (Aug-Nov)	WRDL03
Entoloma indutoides	base rich grassland	Aug (Sept-Oct) Nov	BritRDL06
Entoloma mougeotii	grassland	July (Aug-Oct) Nov	WRDL03
Entoloma prunuloides	grassland	May (Aug-Nov) Dec	WRDL03
Entoloma querquedula	grassland	Aug (Sept-Oct) Nov	WRDL03
Entoloma roseum	base rich grassland	July (Aug-Oct) Nov	WRDL03
Geastrum lageniforme	soil	Jan (Aug-Nov) Dec	BritRDL06
Geastrum pectinatum	soil/litter often conifer	Jan (Mar-May)(Sept-Dec)	WRDL03
Geastrum striatum	soil/litter	Jan (Aug-Dec)	WRDL03
Geoglossum atropurpureum	**grassland**	**Aug (Sept-Nov) Dec**	**S42**
Geoglossum elongatum	base rich grassland	(Oct-Nov) Dec	BritRDL06
Hygrocybe calciphila	base rich grassland	July (Aug-Nov) Dec	WRDL03
Hygrocybe calyptriformis	grassland	April (Aug-Nov) Jan	BritRDL06
Hygrocybe ovina	grassland	Jul (Aug-Nov)	WRDL03
Hygrocybe phaeococcinea	grassland (? base rich)	Jul (Oct) Nov	WRDL03
Lactarius evosmus	mainly *Helianthemum*	Aug (Sept-Oct) Nov	WRDL03
Lactarius helvus	mainly *Pinus*	Jul (Aug-Oct) Nov	WRDL03
Lactarius lilacinus	mainly *Alnus*	Aug (Sept-Oct) Nov	WRDL03
Microglossum olivaceum	**unimproved grassland**	**Aug (Sept-Nov) Jan**	**S42**
Mycena olivaceomarginata	grass	Jan (Sept-Nov) Dec	WRDL03
Naucoria scolecina	*Alnus*	April (Aug-Oct) Nov	WRDL03
Omphalina galericolor var. *lilacinicolor*	grass/moss	Sept (Nov)	WRDL03
Omphalina mutila	moss /conifers	(July-Sept) Oct	WRDL03
Ophiocordyceps forquignonii	dead fly	Mar (July-Nov) Jan	WRDL03
Panaeolus cinctulus	dung/grass/litter	Jan (June-Oct) Nov	WRDL03
Peziza gerardii	sand/soil	June (Oct)	WRDL03
Phylloporia ribis	on broadleaf wood	all year	WRDL03
Puccinia hysterium (micro)	*Tragopogon pratensis*	Mar (May-Jun) Sept	RustWRDL15
Puccinia luzulae (micro)	*Luzula pilosa*	Apr (May-Sept) Nov	RustWRDL15
Ramariopsis tenuiramosa	base rich soil/litter	Sept-Nov	WRDL03
Russula alnetorum	*Alnus*	Aug (Oct) Dec	WRDL03
Russula aurea	*Betula/Quercus*	June (Aug-Oct) Nov	BritRDL06
Russula cessans	conifer plantation	June (Aug-Oct) Dec	WRDL03

3.3 Microfungi SoCC

As a pragmatic conservation approach all the assessments in this report (including the tables above) do incorporate SoCC microfungi information where available, in view of the importance of the recent publication of the Rust Red Data List (Woods *et al*. 2015). Thus six taxa of rust microfungi are included*: Chrysomyxa pirolata, Puccinia hydrocotyles, Puccinia elymi, Puccinia hysterium, Puccinia luzulae* and *Puccinia dioicae var. schoeleriana*, together with one species of smut *Entyloma eryngii* (Evans *et al.* 2006).

Wintergreen rust *Chrysomyxa pirolata* is a S42 species which grows on round-leaved wintergreen *Pyrola rotundifolia* var. *maritima.* Newborough is its only known site in Wales.

Rusty pennies *Puccinia hydrocotyles* is a rust of marsh pennywort *Hydrocotyle vulgaris* and is recorded from three Welsh dune sites: Newborough, Pendine/Laugharne, and Ynyslas.

Puccinia elymi occurs on both lyme-grass *Leymus arenarius* and marram *Ammophila arenaria* and is recorded from six sites in Wales: Crymlyn Burrows, Gronant Talacre, Pendine/Laugharne, Poppit Sands, Pwllheli, and Ynyslas.

Puccinia hysterium is found on goat's-beard *Tragopogon pratensis* and is not deemed a dune species but rather one with a wayside habitat. It has been recorded from Tenby.

Puccinia luzulae occurs on hairy wood-rush *Luzula pilosa* and has only been recorded from one dune site in Wales: Morfa Harlech.

Puccinia dioicae var. *schoeleriana* occurs on common ragwort *Senecio jacobaea* and sand sedge *Carex arenaria.* It has been fouund at four Welsh dune sites: on ragwort at Morfa Harlech and sand sedge at Aberffraw, Rhosneigr, and Newborough.

The only other microfungus SoCC from dunes in Wales (Evans et al 2006) is the sea holly smut *Entyloma eryngii* found on sea holly *Eryngium maritimum* at four dune sites: Crymlyn Burrows, Oxwich, Pembrey, and Pwllheli.

3.4 SoCC Site Accounts Summary

The 106 fungal taxa of conservation concern are recorded from 34 of the 44 standardised dune sites used in this report and a full A-Z site listing is given for them below (see tables 3.4 to 3.37). The information displayed relates to the most recent record and includes the year, grid reference (if any), and the individual who found the specimen, all of which may help toward refinding the species for monitoring purposes in future. The current name is also followed by the number of dates at which the species has been recorded at the site, giving a very loose indication of how often it has been recorded.

It is worth emphasising however that grid references may not refer to the exact location of the fruitbody but may be a generalised reference for the site visit. The number of dates can also only be regarded as a minimum, especially for dunes in north Wales where some detailed fungal records are still held by individuals (B. Ing, C. Aron) or are only available in the form of a summarised report without visit dates (M. Rotheroe).

3.5 SoCC Site Accounts A-Z

The following tables are alphabetically arranged by dune site and list the fungal Species of Conservation Concern recorded at each site. S42 species are in bold red, dune specialists (Table 3.1) are indicated by * and dune species (in Wales) (Table 3.2) are indicated by #.

Table 3.4 Aberdovey (VC 48, Merionethshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
#*Agrocybe pediades* (1)	5-8	1979	Aberdovey Sand Dunes	n/a	R. Brown
***Cyathus stercoreus* (1)**	9-10	1987	Aberdovey	SN69	M.C. Clark

Table 3.5 Aberffraw (VC 52, Anglesey)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Camarophyllopsis schulzeri (1)	8-11	2011	Aberffraw Common	SH35956815	C.E. Aron
Clavaria incarnata (1)	9-11	1999	Aberffraw Common	SH36	anon
#*Clitocybe agrestis* (1)	10-11	2011	Aberffraw	SH3669	P. O'Reilly
Cyathus striatus (1)	8-11	1983	Aberffraw	SH36	R.S.
Entoloma mougeotii (1)	8-10	2011	Aberffraw	SH3669	J. Darby
****Geastrum elegans* (2)**	**9-12**	**2000**	**Aberffraw Common**	**n/a**	**M. Rotheroe**
***Hebeloma dunense* (1)**	5-11	2001	Aberffraw Common	n/a	C.E. Aron
Hygrocybe calciphila (4)	8-11	2011	Aberffraw Common	SH36026818	C.E. Aron
***Inocybe arenicola* (1)**	8-10	n/a	Aberffraw Common	n/a	C.E. Aron
***Inocybe impexa* (1)**	9	1995	Aberffraw	n/a	anon
#*Mycenella salicina* (1)	11	2011	Aberffraw Common	SH36026818	C.E. Aron
***Puccinia dioicae var. schoeleriana**	10-11	n/a	Aberffraw	n/a	n/a
#*Russula persicina* (1)	8-10	n/a	Aberffraw Common	n/a	C.E. Aron
****Tulostoma melanocyclum* (1)**	**9-11**	**2011**	**Aberffraw Common**	**SH35706776**	**C.E. Aron**

Table 3.6 Abergele (VC 50, Denbighshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
#*Limacella delicata* (1)	8-11	1980	Abergele	n/a	anon
#*Limacella guttata* (1)	9-10	1980	Abergele	n/a	anon

Table 3.7 Barafundle (VC 45, Pembrokeshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
**Coprinopsis ammophilae* (1)	8-11	2013	Barafundle, Stackpole	SR989951	D. Harries
***Geoglossum atropurpureum* (1)**	**9-11**	**2013**	**Barafundle, Stackpole**	**SR988952**	**D. Harries**

Table 3.8 Broadhaven (VC 45, Pembrokeshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
**Coprinopsis ammophilae* (1)	8-11	2013	Broadhaven South dunes (NT)	SR977941	D. Harries

Table 3.9 Castlemartin (VC 45, Pembrokeshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
#Agrocybe pediades (1)	5-8	2011	Castlemartin Range West (MOD)	SM885002	D. Harries
Clavulinopsis laeticolor (1)	9-11	2005	Castlemartin Ranges, Brownslade Burrows south	SR897978	S. Bosanquet
***Entoloma bloxamii* (2)**	**8-11**	**2008**	**Castlemartin Range west**	**SR889974**	**D. Harries**
#Entoloma excentricum (2)	8-10	2011	Castlemartin Range West (MOD)	SR897985	D. Harries
Entoloma indutoides (2)	9-10	2011	Castlemartin Range West	SR891977	J. Hodges
Entoloma prunuloides (1)	8-11	2008	Castlemartin Range west	SR901955	D. Harries
Hygrocybe calciphila (4)	8-11	2011	Castlemartin Range West (MOD)	SR891977	J. Hodges
**Leucoagaricus barssii*(1)	8-10	1993	Castlemartin	n/a	anon

Table 3.10 Crymlyn Burrows (VC 41, Glamorganshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
**Bovista limosa* (1)	9-11	1994	Crymlyn Burrows	SS7193	G.B.
**Coprinopsis ammophilae* (1)	8-11	1994	Crymlyn Burrows	SS7193	P.M. David
#Cortinarius diabolicus(1)	9-11	1994	Crymlyn Burrows	SS7193	G. Kibby
**Entyloma eryngii* (1)	8-11	1994	Crymlyn Burrows	SS7193	E. Mordue
#Lactarius controversus (1)	8-11	1994	Crymlyn Burrows	SS7193	anon
**Puccinia elymi* (1)	7-12	2003	Crymlyn Burrows	SS718933	N. Stringer
#Russula lilacea (1)	8-10	1994	Crymlyn Burrows	SS7193	P. Leonard

Table 3.11 Freshwater East (VC 45, Pembrokeshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
***Hohenbuehelia culmicola* (1)**	**10-1**	**2012**	**Freshwater East LNR**	**SS016978**	**D. Harries**
Hygrocybe calciphila (2)	8-11	2012	Freshwater East LNR	SS018980	M. Karpaty

Table 3.12 Freshwater West (VC 45, Pembrokeshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
#Agrocybe pediades (1)	5-8	2013	Freshwater West (NT)	SM885002	D. Harries
**Campanella caesia* (1)	9-11	2013	Freshwater West (NT)	SM885002	D. Harries
**Coprinopsis ammophilae* (3)	8-11	2013	Freshwater West (NT)	SM885002	D. Harries
#Entoloma excentricum (1)	8-10	2008	Freshwater West	SR886999	D. Harries
Hygrocybe calciphila (1)	8-11	2005	Kilpaison Burrows south	SM894001	S. Bosanquet
**Leucoagaricus barssii*(1)	8-10	2011	Freshwater West (NT)	SM885002	D. Harries

Table 3.13 Gronant and Talacre (VC 51, Flintshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Camarophyllopsis schulzeri (1)	8-11	n/a	Talacre Warren	n/a	B. Ing
**Cyathus stercoreus* (2)	9-10	1985	Talacre Warren	SJ1285	B. Ing
***Hohenbuehelia culmicola* (1)**	**10-1**	**1978**	**Talacre Warren**	**n/a**	**B. Ing**
**Psathyrella flexispora* (1)	10-11	n/a	Talacre Warren	n/a	B. Ing
**Puccinia elymi* (1)	7-12	1985	Point of Air	SJ1285	B. Ing

Table 3.14 Gwbert (VC 46, Cardiganshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
**Cyathus stercoreus* (1)	9-10	n/a	Gwbert	n/a	anon
#Melanoleuca schumacheri (1)	10-11	n/a	Gwbert	n/a	anon

Table 3.15 Kenfig (VC 41, Glamorganshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Agaricus comtulus (1)	8-11	1992	Kenfig	n/a	M. Rotheroe
Agaricus porphyrizon (1)	8-11	n/a	Kenfig NNR	n/a	anon
#Agrocybe pediades (1)	5-8	1992	Kenfig Burrows	SS7981	R.C.
**Bovista limosa* (1)	9-11	1992	Kenfig Burrows	n/a	P.R.
#Clitocybe agrestis (1)	10-11	1992	Kenfig Burrows	n/a	anon
**Coprinopsis ammophilae* (1)	8-11	1992	Kenfig Burrows	n/a	anon
#Entoloma sericeum var. cinereo-opacum (1)	10-11	1992	Kenfig Burrows NNR	SS800800	M. Rotheroe
#Gamundia striatula (1)	9-11	1992	Kenfig Burrows	SS7981	A.W. Brand
**Hebeloma dunense* (1)	5-11	1992	Kenfig Burrows	SS7981	A. Henrici
Hygrocybe calciphila (1)	8-11	1997	Kenfig NNR	SS7882	S.E. Evans
#Lactarius controversus (1)	8-11	1989	Kenfig NNR	n/a	M. Rotheroe
#Melanoleuca albifolia (2)	10-11	1991	Kenfig National Nature Reserve	n/a	M. Rotheroe
Mycena olivaceomarginata (1)	9-11	1992	Kenfig Burrows	SS7981	A.W. Brand
Panaeolus cinctulus (1)	6-10	1992	Kenfig Burrows	SS7981	R.C.
***#Poronia punctata* (1)**	**9-4**	**1890**	**Kenfig**	**SS8081**	**E. Gepp**
#Russula persicina (1)	8-10	n/a	Kenfig NNR	n/a	anon

Table 3.16 Merthyr Mawr (VC 41, Glamorganshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
#Agrocybe pediades (1)	5-8	2014	Merthyr Mawr	SS870774	anon
Cyathus striatus (1)	8-11	1973	Merthyr Mawr	SS8877	anon
Geastrum lageniforme (1)	8-11	2003	Merthyr Mawr NNR	SS8677	M. Rotheroe
**Helvella leucopus* (3)	4-5	2006	Bridgend, Merthyr Mawr NNR	SS87037670	A.M. Ainsworth
**Inocybe impexa* (1)	9	2003	Merthyr Mawr NNR	SS8677	P.M. David
#Morchella elata (1)	3-5	1991	Merthyr Mawr	SS8777	M. Rotheroe
Russula cessans (1)	8-10	1973	Merthyr Mawr	SS8877	anon
****Tulostoma melanocyclum* (3)**	**9-11**	**2000**	**Merthyr Mawr (nr. Bridgend)**	**SS8676**	**J. Wynne-Jones**

Table 3.17 Morfa Dinlle (VC 49, Caernarvonshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Clavaria incarnata (1)	9-11	2000	Morfa Dinlle	SH4459	P.R.
Clavulinopsis laeticolor (1)	9-11	2003	Dinas Dinlle Dune system	SH4360	D. Evans

Table 3.18 Morfa Dyffryn (VC 48, Merionethshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Agaricus comtulus (2)	8-11	2002	Morfa Dyffryn, Bennar dunes. Compartment 2	SH57262257	A.N. & J.E. Graham
#Agrocybe pediades (7)	5-8	2011	Morfa Dyffryn	SH5624	J.H. Smith
Clavulinopsis laeticolor (3)	9-11	2011	Morfa Dyffryn	n/a	S.E. Evans
#Clitocybe agrestis (1)	10-11	2011	Morfa Dyffryn	SH5624	R. Shotbolt
#Coprinus sterquilinus (2)	8-11	2011	Morfa Dyffryn	SH5624	P. Cullington
#Cortinarius saturninus(1)	9-11	2011	Morfa Dyffryn	SH5624	J.H. Smith
Crepidotus luteolus (1)	9-12	2001	Morfa Dyffryn, Bennar dunes. Compartment 1	SH57352227	A.N. & J.E. Graham
**Cyathus stercoreus* (1)	9-10	2001	Morfa Dyffryn, Bennar dunes. Compartment 1	SH57002266	A.N. & J.E. Graham
#Gamundia striatula (1)	9-11	2001	Morfa Dyffryn, Bennar dunes. Compartment 2	SH57302252	A.N. & J.E. Graham
**Hebeloma dunense* (1)	5-11	2007	Morfa Dyffryn	SH565236	A.N. & J.E. Graham
****Hohenbuehelia culmicola* (1)**	**10-1**	**2001**	**Morfa Dyffryn, Bennar dunes. Compartment 1**	**SH57142245**	**A.N. & J.E. Graham**
**Leucoagaricus barssii* (2)	8-10	2004	Morfa Dyffryn, Bennar dunes. Compartment 1 & 2	SH573225	A.N. & J.E. Graham
#Omphalina galericolor (1)	10-11	2001	Morfa Dyffryn, Bennar dunes. Compartment 1	SH57162246	A.N. & J.E. Graham
#Omphalina galericolor var. *lilacinicolor* (3)	11	2001	Morfa Dyffryn, Bennar dunes. Compartment 1	SH57162246	A.N. & J.E. Graham
Panaeolus cinctulus (1)	6-10	2001	Morfa Dyffryn, Bennar dunes. Compartment 2	SH574223	A.N. & J.E. Graham
**Puccinia dioicae* (1)	10-11	1976	Morfa Dyffryn	SH5624	anon
Ramariopsis tenuiramosa (1)	9-11	2011	Morfa Dyffryn	SH5624	J.H. Smith
Russula aurea (1)	8-10	1993	Morfa Dyffryn	n/a	anon
#Stropharia luteonitens (2)	6-10	2001	Morfa Dyffryn, Bennar dunes. Compartment 1	SH57072269	A.N. & J.E. Graham
****Tulostoma melanocyclum* (2)**	**9-11**	**2011**	**Morfa Dyffryn**	**SH5624**	**P. Cullington**

Table 3.19 Morfa Harlech (VC 48, Merionethshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
#Agrocybe pediades (1)	5-8	1998	Harlech sand dunes	SH5633	K.A. Robinson
Clavulinopsis laeticolor (1)	9-11	2011	Morfa Harlech	SH5633	S.Skeates
#Clitocybe agrestis (2)	10-11	2011	Morfa Harlech	SH5732	J.H. Smith
Coprinopsis cinereofloccosa (1)	9-11	1993	Morfa Harlech	n/a	anon
#Cortinarius fulvosquamosus (1)	9-10	1987	Morfa Harlech	SH570330	R.G. Betts
#Cortinarius saturninus(1)	9-11	2011	Morfa Harlech	SH 5715327	C.E. Aron
Geastrum pectinatum (1)	3-5 & 9-12	2002	Morfa Harlech, Harlech Forest	SH571329	A.N. & J.E. Graham
Geastrum striatum (1)	8-12	1896	Harlech	SH53	E. Cleminshaw
Hygrocybe ovina (1)	8-11	1987	Morfa Harlech	SH5725	R. Watling
**Inocybe arenicola* (2)	8-10	2011	Morfa Harlech	SH5732	E. Arnolds
#Lactarius controversus (1)	8-11	n/a	Morfa Harlech	n/a	anon
Omphalina mutila (1)	7-9	1986	Harlech NNR	n/a	M. Rotheroe
**Puccinia dioicae* var. *schoeleriana* (1)	10-11	1953	Harlech	SH53	anon
Puccinia luzulae (1)	5-9	1998	Morfa Harlech	SH5733	B. Ing
Ramariopsis tenuiramosa (1)	9-11	2011	Morfa Harlech	SH5633	P.R. Smith
Russula cessans (1)	8-10	2011	Morfa Harlech	SH 5694326	C.E. Aron
#Russula persicina (2)	8-10	2011	Morfa Harlech	SH5633	P. Cullington
#Russula torulosa (1)	10	2002	Morfa Harlech, Harlech Forest	SH569329	A.N. & J.E. Graham
#Stropharia luteonitens (1)	6-10	2011	Morfa Harlech	SH5732	S.E. Evans
****Tulostoma melanocyclum* (2)**	**9-11**	**2014**	**Morfa Harlech**	**n/a**	**anon**

Table 3.20 Newborough (VC 52, Anglesey)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Agaricus porphyrizon (1)	8-11	2011	Newborough Warren	SH4365	R. Shotbolt
Agaricus silvicola (1)	9-10	1988	Newborough Warren	SH46	A.J. Silverside
#Agrocybe pediades (1)	5-8	1950	Newborough Warren	SH4063	anon
**Bovista limosa* (3)	9-11	2000	Newborough Warren	n/a	D.A. Evans
****Chrysomyxa pirolata (1)***	**4-8**	**n/a**	**Newborough**	**n/a**	**B. Ing**
Clavaria incarnata (1)	9-11	2001	Newborough Warren	SH436637	D.A. Evans
#Clitocybe agrestis (1)	10-11	2011	Newborough Warren	SH4264	R. Shotbolt
#Cortinarius limonius (1)	8-10	2009	Newborough	SH412670	R.G. Betts
#Cortinarius saturninus (1)	9-11	2011	Newborough Warren	SH4264	R. McHugh
Entoloma catalaunicum (1)	9-10	2011	Newborough Warren	SH4264	R. McHugh
#Gamundia striatula (1)	9-11	1997	Newborough Warren	n/a	C.E. Aron
Geoglossum elongatum (1)	10-11	2001	Newborough Warren	SH436637	D.A. Evans
**Hebeloma dunense* (1)	5-11	2002	Newborough Warren	n/a	C.E. Aron
**Inocybe arenicola* (1)	8-10	2011	Newborough Warren	SH4264	R. Shotbolt
#Lactarius controversus (7)	8-11	2011	Newborough Warren	SH4264	P. Cullington
Lactarius helvus (1)	8-10	1978	Newborough	n/a	anon
#Melanoleuca schumacheri (1)	10-11	1985	Newborough	n/a	anon
***#Poronia punctata* (1)**	**9-4**	**2011**	**Newborough Warren**	**SH4264**	**J. Darby**
**Puccinia dioicae var. schoeleriana*	10-11	n/a	Newborough	n/a	n/a
**Puccinia hydrocotyles* (3)	10-11	2011	Newborough Warren	SH 4148629	C.E. Aron
Russula cessans (2)	8-10	2011	Newborough Warren	SH4264	P. Cullington
#Russula laccata (1)	8-11	n/a	Newborough Warren	n/a	C.E. Aron
#Russula persicina (1)	8-10	2011	Newborough Warren	SH4264	R. McHugh
#Russula torulosa (2)	10	2011	Newborough Warren	SH4264	P. Cullington

Table 3.21 Ogmore Down (VC 41, Glamorganshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Agaricus comtulus (1)	8-11	2006	Ogmore Down	SS97617616	D. Mitchel
Agaricus porphyrizon (3)	8-11	2007	Ogmore Down	SS888760	D. Mitchel
**Bovista limosa* (1)	9-11	2004	Ogmore	n/a	T. Davies
Chamaemyces fracidus (3)	7-10	2010	Ogmore Down (vale)	SS878761	S.E. Evans
Clavulinopsis laeticolor (3)	9-11	2010	Ogmore Down (vale)	SS878761	P.J. Roberts
Cortinarius anomalus (1)	10-11	2004	Ogmore Down	SS897076	D. Mitchel
***Entoloma bloxamii* (1)**	**8-11**	**2010**	**Ogmore Down (vale)**	**SS87647622**	**S.E. Evans**
Entoloma exile (3)	8-11	2010	Ogmore Down (vale)	SS878761	S.E. Evans
Entoloma prunuloides (3)	8-11	2010	Ogmore Down (vale)	SS878761	P.J. Roberts
#*Entoloma sericeum var. cinereo-opacum* (1)	10-11	2010	Ogmore Down (vale)	SS878761	P.J. Roberts
***Geoglossum atropurpureum* (1)**	**9-11**	**2007**	**Ogmore Down**	**SS888760**	**D. Mitchel**
Hygrocybe calciphila (1)	8-11	2010	Ogmore Down (coastal)	SS875763	S.E. Evans
Lactarius evosmus (1)	9-10	2007	Ogmore Down	SS89947632	D. Mitchel
***Microglossum olivaceum* (2)**	**9-11**	**2010**	**Ogmore Down (vale)**	**SS875761**	**S.E. Evans**
#*Omphalina galericolor* (1)	10-11	2010	Ogmore Down (vale)	SS878761	P.J. Roberts

Table 3.22 Oxwich (VC 41, Glamorganshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
**Bovista limosa* (2)	9-11	1994	Oxwich Burrows	SS5086	P.M. David
**Campanella caesia* (1)	9-11	2006	Oxwich Burrows NNR	SS50308675	A.M. Ainsworth
#Clitocybe agrestis (1)	10-11	2006	Oxwich NNR	SS0086	A. Andrews
**Coprinopsis ammophilae* (1)	8-11	1995	Oxwich	n/a	anon
Cortinarius anomalus (1)	10-11	1994	Oxwich Dunes	SS5086	G. Kibby
#Cortinarius saturninus (1)	9-11	1994	Oxwich Burrows	SS5086	P.M. David
Entoloma roseum (1)	8-10	1994	Oxwich Woods	SS5086	G. Kibby
**Entyloma eryngii* (1)	8-11	1994	Oxwich NNR	SS5086	B. Ing
#Gyrodon lividus (1)	8-10	1994	Oxwich Burrows	SS5086	M. Rotheroe
**Hebeloma dunense* (1)	5-11	1992	Oxwich Burrows	n/a	anon
#Lactarius controversus (1)	8-11	1994	Oxwich Burrows	SS5086	P.M. David
Lactarius lilacinus (1)	9-10	1994	Oxwich Burrows	SS5086	G. Kibby
**Leucoagaricus barssii* (1)	8-10	2006	Oxwich NNR	SS0086	A. Andrews
***Microglossum olivaceum* (1)**	**9-11**	**2007**	**Oxwich**	**SS505873**	**anon**
Naucoria scolecina (1)	8-10	1992	Oxwich	n/a	anon
#Omphalina galericolor (1)	10-11	1992	Oxwich	SS5087	J.P.P.
#Omphalina galericolor var. *lilacinicolor* (1)	11	1992	Oxwich	SS5087	J.P.P.
Panaeolus cinctulus (1)	6-10	1992	Oxwich	SS5087	R.C.
***#Poronia punctata* (1)**	**9-4**	**2007**	**Oxwich**	**SS505875**	**anon**
Russula alnetorum (1)	10	1994	Oxwich Dunes	SS5086	G. Kibby
#Russula laccata (1)	8-11	1992	Oxwich	SS5087	R.C.
****Tulostoma melanocyclum* (1)**	**9-11**	**1917**	**Oxwich Dunes**	**n/a**	**E.M. Wakefield**

Table 3.23 Pembrey (VC 44, Carmarthenshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Agaricus silvicola (1)	9-10	1994	Pembrey Park	SN4000	G. Kibby
**Ascobolus behnitziensis* (1)	9-10	1994	Pembrey	SN4000	M. Rotheroe
**Bovista limosa* (1)	9-11	1991	Pembrey Dunes	n/a	P.A. Jones
**Campanella caesia* (1)	9-11	2006	Tywyn Burrows	SN368038	A. Andrews
Clavaria straminea (1)	9-11	2006	Tywyn Burrows MOD	SN36770392	A.M. Ainsworth
#*Clitocybe agrestis* (1)	10-11	2006	Pembrey MOD	SN3703	S.E. Evans
#*Conocybe lenticulospora* (1)	10-11	1994	Tywyn Burrows	n/a	anon
#*Cortinarius mucosus* (1)	8-10	1994	Pembrey Country Park	n/a	S. Tzabar
Crepidotus luteolus (1)	9-12	1994	Pembrey Woods	SN4000	A. Henrici
**Cyathus stercoreus* (1)	9-10	1994	Pembrey Country Park	SN4000	G. Kinsey
#*Dendrocollybia racemosa* (1)	9-10	1994	Pembrey	SN4000	P.A. Jones
**Entyloma eryngii* (1)	8-11	1997	Pembrey Saltings	SN425005	R.H. Davis
Geastrum lageniforme (1)	8-11	2012	Pembrey Country Park	n/a	P.A. Jones
Geastrum pectinatum (2)	3-5 & 9-12	1994	Pembrey Country Park	SN4000	B. Ing
**Helvella leucopus* (1)	4-5	1985	Pembrey Forest	SN40	P.A. Jones
***Hohenbuehelia culmicola* (3)**	**10-1**	**1995**	**Pembrey Burrows**	**SN40**	**P.A. Jones**
Hygrocybe calciphila (1)	8-11	2006	Tywyn Burrows	SN4104	J. Weir
Hygrocybe calyptriformis (1)	8-11	2000	Pembrey	SN4201	P.A. Jones
Hygrocybe phaeococcinea (1)	10	2006	Pembrey MOD	SN3703	S.E. Evans
**Inocybe arenicola* (1)	8-10	1986	Pembrey	n/a	anon
#*Lyophyllum gangraenosum* (1)	9-11	1994	Pembrey Country Park	SN4000	G. Kibby
#*Melanoleuca albifolia* (1)	10-11	n/a	Tywyn Burrows	n/a	anon
Ophiocordyceps forquignonii (1)	7-11	1988	Llanelli (near), Pembrey	SN4303	P.A. Jones
Peziza gerardii (1)	10	1980	Pembrey	SN40	P.A. Jones
Russula cessans (1)	8-10	1994	Pembrey Country Park	SN4000	G. Kibby

Table 3.24 Pendine/Laugharne (VC 44, Carmarthenshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
#*Agrocybe pediades* (1)	5-8	n/a	Pendine	n/a	anon
**Coprinopsis ammophilae* (1)	8-11	1905	Pendine	n/a	anon
#*Cortinarius saturninus*(1)	9-11	1993	Pendine	n/a	anon
Entoloma mougeotii (1)	8-10	1993	Pendine/Laugharne	SN3007	M. Rotheroe
**Inocybe arenicola* (1)	8-10	1992	Pendine	n/a	anon
#*Melanoleuca albifolia* (1)	10-11	1993	Pendine	n/a	anon
Naucoria scolecina (1)	8-10	1993	Pendine	n/a	anon
#*Peziza prosthetica* (1)	9-10	1981	Laugharne Burrows	n/a	anon
**Puccinia elymi* (1)	7-12	2009	Ginst Point	SN322080	A.O. Chater
**Puccinia hydrocotyles*(1)	10-11	2012	MoD Pendine	SN310075	A.O. Chater
#*Scutellinia paludicola* (1)	7-10	1993	Pendine	n/a	anon

Table 3.25 Pennard Burrows (VC 41, Glamorganshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
#*Poronia punctata* (1)	**9-4**	**1934**	**Pennard Golf Links**	**SS5588**	**anon**

Table 3.26 Poppit Sands (VC 45, Pembrokeshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
**Cyathus stercoreus* (2)	9-10	2013	Poppit Sands	SN155486	D. Harries
**Puccinia elymi* (1)	7-12	2002	Poppit Sands	SN151486	R.G. Woods

Table 3.27 Porthcawl (VC 41, Glamorganshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Phylloporia ribis (1)	1-12	1932	Porthcawl	n/a	E.M. Thomas
***Tulostoma melanocyclum* (1)**	**9-11**	**2002**	**Porthcawl**	**SS87**	**J.A. Fritton**

Table 3.28 Pwllheli (VC 49, Caernarvonshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
**Entyloma eryngii* (1)	8-11	1932	Pwllheli	n/a	J. Ramsbottom
**Puccinia elymi* (1)	7-12	1932	Pwllheli	n/a	J. Ramsbottom

Table 3.29 Red Wharf Bay (VC 52, Anglesey)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Camarophyllopsis micacea (1)	9-11	2012	Red Wharf Bay	SH54367966	C.E. Aron

Table 3.30 Rhosneigr (VC 52, Anglesey)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Agaricus porphyrizon (1)	8-11	n/a	Rhosneigr	n/a	M. Rotheroe
**Cyathus stercoreus* (1)	9-10	1992	Rhosneigr	SH37	M. Rotheroe
**Inocybe impexa* (1)	9	1985	Rhosneigr	n/a	anon
**Puccinia dioicae var. schoeleriana*	10-11	n/a	Rhosneigr	n/a	n/a

Table 3.31 Shell Island (VC 48, Merionethshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
#*Cortinarius saturninus* (1)	9-11	2011	Shell Island	SH5627	R. Shotbolt
Hygrocybe calciphila (1)	8-11	2011	Shell Island	SH554258	D.A. Evans
**Inocybe arenicola* (1)	8-10	2011	Shell Island	SH5627	I. Ridge
#*Lactarius controversus* (3)	8-11	2011	Shell Island	SH5627	R. Shotbolt
***#Poronia punctata* (1)**	**9-4**	**1925**	**Shell Island**	**SH5526**	**anon**
****Tulostoma melanocyclum* (2)**	**9-11**	**2011**	**Shell Island**	**SH5594258**	**C.E. Aron**

Table 3.32 Stackpole (VC 45, Pembrokeshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Agaricus porphyrizon (1)	8-11	2009	Stackpole Warren NNR	SR985945	D. Harries
#Agrocybe pediades (1)	5-8	2000	Stackpole Compt 41	SR978944	P.W. James
**Bovista limosa* (3)	9-11	2013	Stackpole Warren NNR (NT)	SR985945	D. Harries
Chamaemyces fracidus (1)	7-10	2000	Stackpole Compt 41	SR978944	P.W. James
Clavulinopsis laeticolor (1)	9-11	2013	Stackpole Warren NNR (NT)	SR985945	J. Hodges
**Coprinopsis ammophilae* (1)	8-11	2011	Stackpole Warren NNR (NT)	SR977942	D. Harries
***Entoloma bloxamii* (3)**	**8-11**	**2011**	**Stackpole Warren NNR (NT)**	**SR981941**	**E. Arnolds**
#Entoloma excentricum (5)	8-10	2011	Stackpole Warren NNR (NT)	SR981941	E. Arnolds
Entoloma mougeotii (1)	8-10	2000	Stackpole Compt 50	SR978947	P.W. James
Entoloma prunuloides (6)	8-11	2011	Stackpole Warren NNR (NT)	SR979947	E. Arnolds
Entoloma querquedula (1)	9-10	2011	Stackpole Warren NNR (NT)	SR981941	E. Arnolds
Entoloma roseum (1)	8-10	2011	Stackpole Warren NNR (NT)	SR982942	E. Arnolds
***Geoglossum atropurpureum* (1)**	**9-11**	**2011**	**Stackpole Warren NNR (NT)**	**SR982942**	**D. Harries**
Hygrocybe calciphila (14)	8-11	2013	Stackpole Warren NNR (NT)	SR985945	M. Sutton
#Stropharia luteonitens (2)	6-10	2009	Stackpole Warren NNR	SR985945	D. Harries

Table 3.33 Tenby (VC 45, Pembrokeshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Puccinia hysterium (1)	5-6	1926	Tenby	SN10	anon

Table 3.34 The Bennett (= Newport Sands) (VC 45, Pembrokeshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
**Cyathus stercoreus* (1)	9-10	1986	Newport Sands	SN04	J.P.S.

Table 3.35 Traeth Lligwy (VC 52, Anglesey)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
**Coprinopsis ammophilae* (1)	8-11	2011	Traeth Lligwy	SH49448720	C.E. Aron
#Limacella illinita (1)	9-11	2006	Lligwy Woods	SH493854	C.E. Aron

Table 3.36 Whiteford Burrows (VC 41, Glamorganshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Agaricus luteomaculatus (1)	10-11	1992	Whiteford Burrows	SS4495	P.A.
**Bovista limosa* (1)	9-11	1992	Whiteford Burrows	SS4495	J.T. Palmer
#Clitocybe agrestis (2)	10-11	2006	Whiteford Burrows	SS4494	T. Grebenc
#Contumyces rosellus (1)	10-12	1992	Whiteford Burrows	n/a	anon
**Coprinopsis ammophilae* (3)	8-11	2006	Whiteford Burrows	SS4494	P.M. David
#Cortinarius saturninus (1)	9-11	1995	Whiteford Burrows	n/a	anon
#Helvella costifera (1)	8-9	1991	Whiteford Burrows	SS4495	anon
#Helvella queletii (1)	4-5 & 9	1996	Whiteford Burrows	SN4595	M. Rotheroe
****Hohenbuehelia culmicola* (1)**	**10-1**	**1977**	**Broughton Burrows**	**n/a**	**P.A. Jones**
Hygrocybe phaeococcinea (1)	10	2006	Gower (Gwyr), Whiteford Burrows NNR	SS4494	A. Henrici
**Inocybe arenicola* (2)	8-10	1992	Whiteford Burrows	SN4595	J.H.
**Inocybe impexa* (1)	9	1965	Whiteford Burrows	n/a	anon
#Lactarius controversus (1)	8-11	2006	Whiteford Burrows	SS4494	D.J. Schafer
#Melanoleuca albifolia (1)	10-11	1996	Whiteford Burrows	n/a	anon
#Morchella elata (1)	3-5	1996	Whiteford Burrows	SN4595	P.M. David
Mycena olivaceomarginata (2)	9-11	1995	Whiteford Burrows	n/a	anon
#Naucoria salicetorum (1)	10	1991	Whiteford Burrows	n/a	M. Rotheroe
#Omphalina galericolor (1)	10-11	1992	Whiteford Burrows	SS4495	R.C.
#Omphalina galericolor var. *lilacinicolor* (1)	11	1992	Whiteford Burrows	SS4495	R.C.
Panaeolus cinctulus (1)	6-10	1992	Whiteford Burrows	SS4495	R.C.
#Russula torulosa (1)	10	2006	Gower (Gwyr), Whiteford Burrows	SS440942	M. Kelly
#Stropharia luteonitens (1)	6-10	1991	Whiteford Burrows National Nature Reserve	n/a	M. Rotheroe

Table 3.37 Ynyslas (VC 46, Cardiganshire)

Current Name (No. of separate dates recorded)	Core fruiting months	Most Recent Record	Locality As Recorded	Grid Ref	Collector
Agaricus comtulus (1)	8-11	n/a	Ynyslas	n/a	anon
#*Agrocybe pediades* (4)	5-8	1985	Ynyslas	n/a	M. Rotheroe
**Campanella caesia* (1)	9-11	2011	Ynyslas	SN60749383	A.M. Ainsworth
#*Clitocybe agrestis* (1)	10-11	2011	Ynyslas	SN6192	R. Shotbolt
**Coprinopsis ammophilae* (1)	8-11	2011	Ynyslas	SN6192	P.M. David
#*Cortinarius saturninus*(1)	9-11	1995	Ynyslas	n/a	anon
**Cyathus stercoreus* (9)	9-10	2011	Ynyslas	SN6192	P.R. Smith
***Geastrum elegans* (2)**	**9-12**	**2011**	**Ynyslas**	**SN6192**	**A. Lucas**
#*Melanoleuca albifolia* (1)	10-11	2002	Ynyslas	n/a	M. Rotheroe
#*Melanoleuca schumacheri* (1)	10-11	1985	Ynyslas	n/a	M. Rotheroe
#*Mycenella salicina* (2)	11	1985	Ynyslas	n/a	M. Rotheroe
Omphalina mutila (1)	7-9	1985	Ynyslas	n/a	M. Rotheroe
**Puccinia dioicae* (1)	10-11	1945	Ynyslas	n/a	R.B. Abeli
**Puccinia elymi* (2)	7-12	2012	Ynyslas Dunes	SN607943	A.O. Chater
**Puccinia hydrocotyles* (5)	10-11	2011	nr caravan site, Ynyslas	SN610939	R.N.S.
**Stropharia halophila* (1)	8-11	1985	Ynyslas	n/a	anon
**Trichoglossum rasum* (1)	9	1985	Aberystwyth, Borth, Ynyslas	n/a	M. Rotheroe
***Tulostoma melanocyclum* (1)**	**9-11**	**2011**	**Ynyslas**	**SN6192**	**I. Ridge**

3.6 Dune Fungi in Wales

Making any kind of evaluation of all macrofungi records from dunes, not just those of conservation concern, is only really possible if there is some measure like the CHEG system of evaluating waxcap-grasslands available to recorders and site managers. Currently nothing of the kind has been proposed for dunes so in an attempt to begin this process, data for this project have as an addition to the brief also been assessed to derive a list of species which are mainly recorded from dunes in Wales based on the wider dataset of UK records in the FRDBI.

This list of dune fungi in Wales is only provisional and will change over time with better understanding of species concepts and further targeted recording. It may also be found appropriate to include certain 'interim' taxa on a discretionary basis from table 3.2 which includes species that are not mainly in dunes in the UK but are mainly in dunes in Wales. One such species which might be given discretionary dune status based on its listing on Section 42 in Wales is the nail fungus *Poronia punctata* although its main habitat in the UK is heath or grassland grazed by 'unmedicated' ponies**.**

Based purely on species found mainly in dunes (in a UK context) there are an additional 34 non SoCC taxa in Wales assessed as dune species. The most widespread based on this dataset are *Conocybe dunensis* (21 sites), *Geoglossum cookeanum* (23 sites),

Hygrocybe conicoides (24 sites) *Psathyrella ammophila* (28 sites) and *Tulostoma brumale* (21 sites) and the least recorded are *Agaricus bernardii, Lepista multiformis* and *Tulostoma fimbriatum (*each only at one dune site).

These non-SoCC dune species in Wales are listed in table 3.38 with details of all dune locations where each has been found and the year most recently recorded.

Table 3.38 Other dune species in Wales (excluding SoCC species) listed alphabetically

Name	Location	Most recent collection	Vice-county
Agaricus bernardii (1 dune) saline coastal (salted roadsides inland)	Castlemartin	2007	Pembrokeshire
Agaricus devoniensis (16 dunes) with *Ammophila*, dune grassland (slacks)	Aberffraw	2011	Anglesey
	Broad Haven	2011	Pembrokeshire
	Crymlyn Burrows	1994	Glamorganshire
	Freshwater West	2013	Pembrokeshire
	Gronant and Talacre	pre 2000	Flintshire
	Kenfig	1995	Glamorganshire
	Merthyr Mawr	1992	Glamorganshire
	Morfa Dinlle	2011	Caernarvonshire
	Morfa Harlech	2011	Merionethshire
	Newborough	n/a	Anglesey
	Oxwich	pre 1995	Glamorganshire
	Pendine/Laugharne	pre 1995	Carmarthenshire
	Rhosneigr	1985	Anglesey
	Stackpole	2012	Pembrokeshire
	Whiteford Burrows	1992	Glamorganshire
	Ynyslas	1987	Cardiganshire
Clitocybe barbularum (13 dunes) with moss/grass, slacks/dune grassland	Aberffraw	2011	Anglesey
	Crymlyn Burrows	1994	Glamorganshire
	Freshwater East	2012	Pembrokeshire
	Freshwater West	2013	Pembrokeshire
	Kenfig	1992	Glamorganshire
	Morfa Dyffryn	pre 1995	Merionethshire
	Morfa Harlech	2009	Merionethshire
	Newborough	n/a	Anglesey
	Oxwich	2006	Glamorganshire
	Pendine/Laugharne	pre 1995	Carmarthenshire
	Stackpole	2013	Pembrokeshire
	Whiteford Burrows	1992	Glamorganshire
	Ynyslas	2011	Cardiganshire

Name	Location	Most recent collection	Vice-county
Conocybe dunensis (21 dunes) *Ammophila*/grass, mobile/slack/grassland	Aberdovey	pre 1995	Merionethshire
	Aberffraw	pre 1995	Anglesey
	Castlemartin	pre 1995	Pembrokeshire
	Crymlyn Burrows	1994	Glamorganshire
	Freshwater East	pre 1995	Pembrokeshire
	Freshwater West	2013	Pembrokeshire
	Gronant and Talacre	pre 2000	Flintshire
	Gwbert	pre 1995	Cardiganshire
	Hillend Burrows	pre 1995	Glamorganshire
	Kenfig	1998	Glamorganshire
	Merthyr Mawr	pre 1995	Glamorganshire
	Morfa Dyffryn	2001	Merionethshire
	Morfa Harlech	pre 1995	Merionethshire
	Newborough	pre 1995	Anglesey
	Oxwich	2004	Glamorganshire
	Pembrey	pre 1995	Carmarthenshire
	Pendine/Laugharne	pre 1995	Carmarthenshire
	Pennard Burrows	pre 1995	Glamorganshire
	Stackpole	2000	Pembrokeshire
	Whiteford Burrows	2006	Glamorganshire
	Ynyslas	2011	Cardiganshire
Entoloma phaeocyathus (2 dunes) with *Ammophila* in mobile or fixed dune	Crymlyn Burrows	1994	Glamorganshire
	Freshwater West	2013	Pembrokeshire
Fomitiporia hippophaëicola (2 dunes) on *Hippophaë rhamnoides* in dune scrub	Merthyr Mawr	2014	Glamorganshire
	Pembrey	2012	Carmarthenshire
Geastrum schmidelii (10 dunes) sandy soil, dune scrub/woodland	Aberdovey	1972	Merionethshire
	Aberffraw	n/a	Anglesey
	Kenfig	1998	Glamorganshire
	Morfa Dyffryn	2011	Merionethshire
	Morfa Harlech	2011	Merionethshire
	Newborough	2011	Anglesey
	Pembrey	1992	Carmarthenshire
	Shell Island	2011	Merionethshire
	Whiteford Burrows	1992	Glamorganshire
	Ynyslas	1987	Cardiganshire

Name	Location	Most recent collection	Vice-county
Geoglossum cookeanum (23 dunes) grass/moss, dune grassland/slacks	Aberffraw	2011	Anglesey
	Broad Haven	2012	Pembrokeshire
	Castlemartin	2006	Pembrokeshire
	Freshwater East	2005	Pembrokeshire
	Freshwater West	2014	Pembrokeshire
	Gronant and Talacre	pre 2000	Flintshire
	Kenfig	1999	Glamorganshire
	Merthyr Mawr	1989	Glamorganshire
	Morfa Dinnle	2000	Caernarvonshire
	Morfa Dyffryn	2011	Merionethshire
	Morfa Harlech	2011	Merionethshire
	Newborough	2011	Anglesey
	Ogmore Down	2010	Glamorganshire
	Oxwich	2006	Glamorganshire
	Pembrey	2006	Carmarthenshire
	Pendine/Laugharne	1993	Carmarthenshire
	Poppit Sands	1988	Pembrokeshire
	Porthcawl	19xx	Glamorganshire
	Rhosneigr	1992	Anglesey
	Shell Island	2011	Merionethshire
	Stackpole	2013	Pembrokeshire
	Whiteford Burrows	2006	Glamorganshire
	Ynyslas	2011	Cardiganshire
Geopora arenicola (9 dunes) bare sandy soil, dune slack	Kenfig	pre 1995	Glamorganshire
	Morfa Dyffryn	2011	Merionethshire
	Morfa Harlech	1947	Merionethshire
	Newborough	1988	Anglesey
	Oxwich	1994	Glamorganshire
	Pembrey	pre 1995	Carmarthenshire
	Pendine/Laugharne	pre 1995	Carmarthenshire
	Shell Island	2011	Merionethshire
	Ynyslas	pre 1995	Cardiganshire
Geopora arenosa (2 dunes) bare sandy soil, dune slack	Oxwich	1992	Glamorganshire
	Whiteford Burrows	1992	Glamorganshire
Hebeloma vaccinum (8 dunes) with *Salix repens*, dune slack	Aberffraw	2011	Anglesey
	Hillend Burrows	pre 1995	Glamorganshire
	Morfa Dyffryn	2011	Merionethshire
	Morfa Harlech	2011	Merionethshire
	Newborough	2011	Anglesey
	Oxwich	1994	Glamorganshire
	Pendine/Laugharne	pre 1995	Carmarthenshire
	Shell Island	2011	Merionethshire

Name	Location	Most recent collection	Vice-county
Hygrocybe conicoides (24 dunes) grass/moss, dune grassland/slacks	Aberdovey	pre 1995	Merionethshire
	Freshwater West	2014	Pembrokeshire
	Gronant and Talacre	pre 1995	Flintshire
	Gwbert	pre 1995	Cardiganshire
	Hillend Burrows	pre 1995	Glamorganshire
	Kenfig	2001	Glamorganshire
	Manorbier	2011	Pembrokeshire
	Merthyr Mawr	2001	Glamorganshire
	Morfa Dinlle	2003	Caernarvonshire
	Morfa Dyffryn	2011	Merionethshire
	Morfa Harlech	2011	Merionethshire
	Newborough	2011	Anglesey
	Nicholaston Burrows	1999	Glamorganshire
	Oxwich	1994	Glamorganshire
	Pembrey	2006	Carmarthenshire
	Pendine/Laugharne	1993	Carmarthenshire
	Pennard Burrows	pre 1995	Glamorganshire
	Poppit Sands	2014	Pembrokeshire
	Rhosneigr	1992	Anglesey
	Shell Island	2011	Merionethshire
	Stackpole	2013	Pembrokeshire
	Tenby	pre 1995	Pembrokeshire
	Whiteford Burrows	2006	Glamorganshire
	Ynyslas	2011	Cardiganshire
Inocybe agardhii (13 dunes) with *Salix* in dune slack/dune scrub	Aberffraw	n/a	Anglesey
	Crymlyn Burrows	1994	Glamorganshire
	Gronant and Talacre	1985	Flintshire
	Kenfig	pre 1998	Glamorganshire
	Merthyr Mawr	1973	Glamorganshire
	Morfa Dyffryn	2011	Merionethshire
	Morfa Harlech	1987	Merionethshire
	Newborough	2011	Anglesey
	Oxwich	pre 1995	Glamorganshire
	Pembrey	1986	Carmarthenshire
	Shell Island	2011	Merionethshire
	Whiteford Burrows	pre 1995	Glamorganshire
	Ynyslas	pre 1995	Cardiganshire
Inocybe dulcamara (13 dunes) with *Salix* in dune slack/dune scrub	Aberffraw	1989	Anglesey
	Gronant and Talacre	pre 2000	Flintshire
	Hillend Burrows	pre 1995	Glamorganshire
	Kenfig	1997	Glamorganshire
	Merthyr Mawr	1999	Glamorganshire
	Morfa Dyffryn	2004	Merionethshire
	Morfa Harlech	2004	Merionethshire
	Newborough	1988	Anglesey
	Oxwich	1994	Glamorganshire
	Pendine/Laugharne	pre 1995	Carmarthenshire
	Shell Island	2011	Merionethshire
	Whiteford Burrows	pre 1995	Glamorganshire
	Ynyslas	2011	Cardiganshire

Name	Location	Most recent collection	Vice-county
Inocybe dunensis (9 dunes) with *Salix repens* in dune slack	Aberffraw	2011	Anglesey
	Gronant and Talacre	pre 2000	Flintshire
	Morfa Dyffryn	2011	Merionethshire
	Morfa Harlech	2011	Merionethshire
	Newborough	2012	Anglesey
	Pembrey	1985	Carmarthenshire
	Pendine/Laugharne	pre 1995	Carmarthenshire
	Shell Island	2011	Merionethshire
	Whiteford Burrows	1991	Glamorganshire
Inocybe heimiana (3 dunes) with *Salix repens*/*Ammophila* in dune slack/mobile dune	Aberffraw	2009	Anglesey
	Newborough	2001	Anglesey
	Shell Island	2009	Merionethshire
Inocybe heimii (2 dunes) with *Salix repens* in dune slack/dune grassland	Aberffraw	2011	Anglesey
	Newborough	2011	Anglesey
Inocybe inodora (2 dunes) with *Salix repens* in dune slack	Aberffraw	n/a	Anglesey
	Newborough	1981	Anglesey
Inocybe pruinosa (5 dunes) with *Salix repens* in dune slack	Aberffraw	2011	Anglesey
	Gronant and Talacre	pre 2000	Flintshire
	Morfa Dyffryn	2011	Merionethshire
	Morfa Harlech	2011	Merionethshire
	Newborough	2012	Anglesey
Inocybe salicis (2 dunes) with *Salix*	Pendine/Laugharne	pre 1995	Carmarthenshire
	Shell Island	2009	Merionethshire
Inocybe serotina (8 dunes) with *Ammophila*/*Salix* throughout dune	Kenfig	pre 1998	Glamorganshire
	Merthyr Mawr	pre 1995	Glamorganshire
	Morfa Dyffryn	2010	Merionethshire
	Morfa Harlech	2003	Merionethshire
	Newborough	1950	Anglesey
	Oxwich	1994	Glamorganshire
	Whiteford Burrows	1992	Glamorganshire
	Ynyslas	1986	Cardiganshire
Inocybe vulpinella (9 dunes) with *Salix repens* in dune slack	Aberffraw	2011	Anglesey
	Morfa Dyffryn	pre 1995	Merionethshire
	Morfa Harlech	1997	Merionethshire
	Newborough	n/a	Anglesey
	Oxwich	1992	Glamorganshire
	Pendine/Laugharne	1993	Carmarthenshire
	Shell Island	2011	Merionethshire
	Whiteford Burrows	1992	Glamorganshire
	Ynyslas	1985	Cardiganshire

Name	Location	Most recent collection	Vice-county
Lepiota erminea (14 dunes) grass/*Salix*, dune grassland/slack	Aberffraw	2011	Anglesey
	Crymlyn Burrows	1994	Glamorganshire
	Gronant and Talacre	pre 2000	Flintshire
	Kenfig	2000	Glamorganshire
	Merthyr Mawr	1999	Glamorganshire
	Morfa Dinlle	2003	Caernarvonshire
	Morfa Dyffryn	2011	Merionethshire
	Morfa Harlech	2011	Merionethshire
	Newborough	2011	Anglesey
	Oxwich	2006	Glamorganshire
	Pendine/Laugharne	pre 1995	Carmarthenshire
	Stackpole	2012	Pembrokeshire
	Whiteford Burrows	2006	Glamorganshire
	Ynyslas	2011	Cardiganshire
Lepista multiformis (1 dune) sandy soil/grass	Ynyslas	2011	Cardiganshire
Marasmius anomalus (11 dunes) with *Ammophila*/grass/*Salix* throughout dune	Aberffraw	2011	Anglesey
	Freshwater East	2012	Pembrokeshire
	Gwbert	pre 1995	Cardiganshire
	Kenfig	1989	Glamorganshire
	Morfa Dyffryn	2001	Merionethshire
	Morfa Harlech	2011	Merionethshire
	Oxwich	2006	Glamorganshire
	Shell Island	2011	Merionethshire
	Traeth Lligwy	2013	Anglesey
	Whiteford Burrows	2006	Glamorganshire
	Ynyslas	2011	Cardiganshire
Melanoleuca cinereifolia (16 dunes) *Ammophila* in mobile dune	Barafundle	2013	Pembrokeshire
	Broad Haven	2014	Pembrokeshire
	Crymlyn Burrows	1994	Glamorganshire
	Freshwater East	2013	Pembrokeshire
	Freshwater West	2013	Pembrokeshire
	Gronant and Talacre	pre 2000	Flintshire
	Newborough	2011	Anglesey
	Oxwich	pre 1995	Glamorganshire
	Pembrey	2006	Carmarthenshire
	Pendine/Laugharne	pre 1995	Carmarthenshire
	Poppit Sands	pre 1995	Pembrokeshire
	Rhosneigr	pre 1995	Anglesey
	Stackpole	2011	Pembrokeshire
	Tenby	pre 1995	Pembrokeshire
	Whiteford Burrows	1992	Glamorganshire
	Ynyslas	2011	Cardiganshire

Name	Location	Most recent collection	Vice-county
Peziza ammophila (16 dunes) *Ammophila* in fore/mobile dune	Aberffraw	n/a	Anglesey
	Barafundle	2013	Pembrokeshire
	Broad Haven	2014	Pembrokeshire
	Crymlyn Burrows	pre 1995	Glamorganshire
	Freshwater West	2013	Pembrokeshire
	Gronant and Talacre	1985	Flintshire
	Kenfig	1997	Glamorganshire
	Morfa Dyffryn	2008	Merionethshire
	Morfa Harlech	1987	Merionethshire
	Newborough	n/a	Anglesey
	Pembrey	2006	Carmarthenshire
	Pendine/Laugharne	pre 1995	Carmarthenshire
	Poppit Sands	2014	Pembrokeshire
	Tenby	pre 1995	Pembrokeshire
	Whiteford Burrows	1992	Glamorganshire
	Ynyslas	1987	Cardiganshire
Peziza boltonii (3 dunes) grass/moss dune grassland	Aberffraw	2011	Anglesey
	Morfa Dyffryn	2001	Merionethshire
	Morfa Harlech	2012	Merionethshire
Peziza pseudoammophila (1 dune) *Ammophila* in mobile dune	Pembrey	1994	Carmarthenshire
Phallus hadriani (8 dunes) *Ammophila*/grass, mobile dune/dune grassland	Aberffraw	1996	Anglesey
	Morfa Bychan	1987	Cardiganshire
	Morfa Dyffryn	2011	Merionethshire
	Morfa Harlech	2011	Merionethshire
	Newborough	2011	Anglesey
	Poppit Sands	2014	Pembrokeshire
	Shell Island	2011	Merionethshire
	Ynyslas	2011	Cardiganshire

Name	Location	Most recent collection	Vice-county
Psathyrella ammophila (28 dunes) with *Ammophila* in mobile dune	Aberdovey	1979	Merionethshire
	Aberffraw	2011	Anglesey
	Barafundle	2013	Pembrokeshire
	Broad Haven	2014	Pembrokeshire
	Castlemartin	pre 1995	Pembrokeshire
	Crymlyn Burrows	1994	Glamorganshire
	Freshwater East	2011	Pembrokeshire
	Freshwater West	2013	Pembrokeshire
	Gronant and Talacre	1985	Flintshire
	Gwbert	pre 1995	Cardiganshire
	Hillend Burrows	pre 1995	Glamorganshire
	Kenfig	1998	Glamorganshire
	Merthyr Mawr	1973	Glamorganshire
	Morfa Dyffryn	2001	Merionethshire
	Morfa Harlech	1997	Merionethshire
	Newborough	2006	Anglesey
	Oxwich	1994	Glamorganshire
	Pembrey	2006	Carmarthenshire
	Pendine/Laugharne	pre 1995	Carmarthenshire
	Pennard Burrows	pre 1995	Glamorganshire
	Poppit Sands	2014	Pembrokeshire
	Red Wharf Bay	2012	Anglesey
	Rhosneigr	pre 1995	Anglesey
	Shell Island	2011	Merionethshire
	Stackpole	2004	Pembrokeshire
	Tenby	pre 1995	Pembrokeshire
	Whiteford Burrows	1992	Glamorganshire
	Ynyslas	2011	Cardiganshire
Simocybe centunculus var. ***maritima*** (3 dunes) on dead stems of *Ammophila* in mobile dune	Newborough	2001	Anglesey
	Whiteford Burrows	1992	Glamorganshire
	Ynyslas	2006	Cardiganshire

Name	Location	Most recent collection	Vice-county
Tulostoma brumale (21 dunes) mosses and lichens (*Tortula*/*Cladonia*), slacks/dune grassland	Aberffraw	pre 1995	Anglesey
	Broad Haven	2014	Pembrokeshire
	Freshwater East	2013	Pembrokeshire
	Freshwater West	2014	Pembrokeshire
	Hillend Burrows	2004	Glamorganshire
	Kenfig	1998	Glamorganshire
	Merthyr Mawr	1999	Glamorganshire
	Morfa Dinlle	2003	Caernarvonshire
	Morfa Dyffryn	2011	Merionethshire
	Morfa Harlech	2011	Merionethshire
	Newborough	2015	Anglesey
	Ogmore Down	2010	Glamorganshire
	Oxwich	2011	Glamorganshire
	Pembrey	2006	Carmarthenshire
	Pennard Burrows	2003	Glamorganshire
	Porthcawl	1933	Glamorganshire
	Red Wharf Bay	1948	Anglesey
	Stackpole	2013	Pembrokeshire
	Tenby	1993	Pembrokeshire
	Whiteford Burrows	2006	Glamorganshire
	Ynyslas	2011	Cardiganshire
Tulostoma fimbriatum (1 dune) sand/grass	Ynyslas	2011	Cardiganshire

4 Discussion

4.1 Species of Conservation Concern in Dunes

Of the 1321 fungal species recorded from Welsh dunes, 106 (8.2%) are species of conservation concern. However, only 1.58% (a relatively small percentage) are assessed as specialist dune SoCC, with an additional 2.72% typical of dunes but only in Wales, and 3.7% classed as non-dune SoCC. Of the 21 specialist dune taxa only 16 are macrofungi which represents just 15% of all SoCC recorded from dunes in Wales.

These are relatively low numbers of SoCC compared with those recorded mainly from woodlands in Wales.

There are a number of reasons for this. Dunes because of their relatively hostile environment tend to be less species-rich than other habitats such as woodland. Also they have tended in general to be under-recorded by mycologists and as a result there are likely to be both undiscovered and cryptic species whose status has not been evaluated and may also be of conservation concern.

Further survey is needed to increase our understanding of which additional species may be classed as dune fungi as well as give a much clearer picture of those which are threatened and in need of conservation status.

The importance of macrofungi in dunes is not in question (see 1.2) but the lack of a current RDL of macrofungi in Wales is a serious impediment to their conservation. This urgently needs to be addressed to take account of the increased recording in the last ten years or so, including a review and revision of the criteria used to compile the list.

In the meantime following the precautionary principle all macrofungi deemed dune species in Wales should be regarded of conservation interest for both survey and monitoring purposes.

4.2 Site Evaluation for Dune Fungi

The Important Fungus Areas report (Evans *et al.* 2001) is a measure by which all sites can be broadly evaluated for their fungi using four criteria: significant populations of SoCC fungi (at least five species); exceptionally rich mycota (over 500 recorded taxa); outstanding example of habitat type; sites deemed important, but requiring further data. The report includes nine qualifying dune sites in Wales:Crymlyn Burrows, Kenfig, Morfa Harlech, Newborough, Oxwich, Pembrey, Pendine/ Laugharne,Ynyslas, and Whiteford Burrows.

The report is now in need of systematic updating, especially given that Wales is relatively poorly represented with only 58 sites evaluated compared with 67 in Scotland and 382 in England. Based on similar criteria a further five dune sites (in addition to the nine listed in 2001) would now qualify based on their SoCC taxa (conservatively not including taxa that are only listed in the Welsh Red Data List). They are: Aberffraw, Castlemartin, Freshwater West, Ogmore Down, and Stackpole.

However for the first time it is possible, by building on the work of this Welsh Dune Fungi project, to additionally propose a tool for evaluating dunes for their fungi, in Wales and in principal across the UK, using a straightforward unweighted taxa count based on all SoCC species (tables 3.1, 3.2, and 3.3) together with all non-SoCC dune species (table 3.38) in Wales.

At this stage such taxa counts can only form the basis of a preliminary minimum ranking as there is a need for more extensive survey to fill gaps in recording knowledge and to update recording in Welsh dunes that have not been recorded systematically or sufficiently since the pioneering work of Maurice Rotheroe nearly 20 years ago (see 4.3 below).

This initial assessment of the importance of the various dune systems in Wales (see table 4.1) highlights in bold font the five dunes in Wales which include important assemblages of fungi as part of their SSSI notification and places them amongst the top 15 ranked sites in Wales. It includes information on numbers of SoCC, dune and all macrofungi recorded at each dune together with any known conservation status. The year of the last record and number of recording visits are also included as a relative measure of recording effort although a visit may range from one casual record to a full site-list of observations.

The sites already mentioning fungi as part of the SSSI are ranked as follows: Newborough 1, Whiteford Burrows 3, Kenfig 7, Gronant /Talacre 10, and Merthyr Mawr 15.

It can be argued that any site ranking equal to or above these (i.e. above Merthyr Mawr) should now for consistency be regarded as of SSSI merit for its fungi. On this basis, a further 10 dune sites in Wales are of SSSI merit based on a dune species count: Morfa Dyffryn, Ynyslas, Morfa Harlech, Oxwich, Aberffraw, Pembrey, Stackpole, Shell Island, Crymlyn Burrows, and Pendine/Laugharne. A further two sites are also of SSSI merit based on their SoCC count: Castlemartin and Ogmore Down.

All, with the exception of Shell Island and Ogmore Down, are already SSSIs and these two sites should be considered for possible notification as a SSSI. All the other sites should have their notification/management amended to reflect their specific dune fungi.

There is very close agreement between dunes evaluated for the significance of their fungi using the Important Fungus Areas criteria and those now being proposed using a SoCC and Dune species (S&D) count. Only three dunes are not in both: Castlemartin, Freshwater West, and Ogmore Down which indicates the need to further assess these sites, especially Ogmore Down which appears to lack site protection.

Undoubtedly much more targeted fungus survey and research are needed to update information and properly evaluate dune fungi in Wales using this proposed ‘S&D’ count methodology.

Table 4.1 Site evaluation based on total dune species recorded

Dune System	Total dune spp	Dune spp rank-ing	No. SoCC spp	SoCC rank-ing	Site Status (generalised)	Total macro fungi	Last record	No. of visits
Newborough	**70**	**1**	**24**	**2**	**SAC SSSI - fungi**	**308**	**2015**	**61**
Morfa Dyffryn	57	2	18	6	SAC SSSI	221	2011	53
Whiteford Burrows	**52**	**3**	**22**	**3**	**SAC SSSI - fungi**	**191**	**2010**	**41**
Ynyslas	52	3	16	7	SAC SSSI	148	2012	84
Morfa Harlech	46	5	20	5	SAC SSSI	208	2012	73
Oxwich	45	6	21	4	SSSI	140	2011	18
Kenfig	**44**	**7**	**16**	**7**	**SAC SSSI - fungi**	**166**	**2003**	**27**
Aberffraw	41	8	14	11	SAC SSSI	94	2011	20
Pembrey	41	8	25	1	SAC SSSI	222	2013	79
Gronant &Talacre	**28**	**10**	**5**	**17**	**SAC SSSI - fungi**	**76**	**?1990**	**?5**
Stackpole	28	10	15	9	SAC SSSI	210	2013	59
Shell Island	26	12	6	15	SAC	63	2011	6
Crymlyn Burrows	24	13	7	14	SSSI	73	2003	2
Pendine/Laugharne	24	13	4	18	SAC SSSI	34	1994	17
Merthyr Mawr	**23**	**15**	**8**	**12**	**SAC SSSI - fungi**	**132**	**2014**	**25**
Freshwater West	18	16	6	15	SAC SSSI	45	2014	36
Freshwater East	13	17	2	20	SAC SSSI	55	2013	19
Aberdovey	10	18	2	20	SAC SSSI	15	1987	8
Poppit Sands	10	18	2	20	SAC SSSI	19	2014	19
Broad Haven	9	20	1	30	SAC SSSI	22	2014	14
Tenby	9	20	1	30	SSSI	12	2005	11
Castlemartin	8	22	8	12	SAC SSSI	65	2011	15
Rhosneigr	8	22	4	18	SSSI	16	1992	5
Ogmore Down	7	24	15	9	not protected	137	2010	13
Barafundle	6	25	2	20	SAC SSSI	8	2013	1
Hillend Burrows	6	25	0	35		6	2004	min 2
Morfa Dinlle	6	25	2	20	SAC SSSI	36	2011	6
Traeth Lligwy	6	25	2	20		21	2013	15
Pennard Burrows	5	29	1	30	SSSI	10	2005	7
Gwbert	4	30	2	20		6	2011	4
Porthcawl	3	31	2	20		6	1974	4
The Bennett	3	31	1	30		13	2011	2
Abergele	2	33	2	20	SAC SSS1	2	1980	2
Red Wharf Bay	2	33	1	30		13	2012	7
Goodwick	0	35	0	35		1	2013	1
Manorbier	1	35	0	35		2	2011	3
Marloes	0	35	0	35		16	2013	3
Morfa Bychan	1	35	0	35	SAC SSSI	1	2012	3
Nicholaston Burrows	1	35	0	35	SSSI	5	2002	3
Penbryn Beach	0	35	0	35		1	1946	1
Penmaen Burrows	0	35	0	35		9	1998	1
Penmaenmawr	0	35	0	35		1	19xx	3
Pwllheli	0	35	2	20		2	1932	4
Tywyn	0	35	0	35		2	1985	1

4.3 Dune Survey and Monitoring Priorities

Although there is a fairly reasonable geographical recording coverage of dune systems across Wales and the majority appear to have been surveyed at some time for macrofungi, it is apparent from the site evaluation table (table 4.1) that recording effort varies widely. Some dunes have been recorded far less than others with only a handful of casual ad hoc records and infrequent visits, often not in recent years. All such dunes should be priorities for fungus survey and monitoring.

Comparison of the dune names in Wales based on Dargie (1995) and Bosanquet (2015) with locality names used by recorders suggest there may be five dunes without any fungus recording. Given uncertainties about precise recorder location this can only be an approximate assessement. These potentially unrecorded dunes are: Abersoch (Caernarvonshire), Tywyn Gwyn (Anglesey), Morfa Abererch SSSI (Caernarvonshire), Kinmel Bay dunes (Denbigh/Flintshire), and St Davids Burrows (Pembrokeshire). If confirmed all these should be priorities for fungus survey.

Dune sites appearing in particular need of current systematic macrofungi survey include: Aberdovey, Aberffraw, Barafundle, Crymlyn Burrows, Freshwater West, Gwbert, Hillend Burrows, Manorbier, Marloes, Morfa Bychan, Nicholaston Burrows, Ogmore Down, Oxwich, Pennard Burrows, Penmaen Burrows, Pwllheli, Red Wharf Bay, Shell Island, and The Bennett/Newport Sands.

Criteria for dunes needing macrofungi survey might include: all dunes ranking above the status of those mentioning fungi in their SSSI notification (i.e. ranked above Merthyr Mawr); dunes currently without site protection; dunes with under 10 visits; dunes with fewer than 50 species of macrofungi recorded (a better measure than records where duplicates skew outcome); and dunes not recorded in the last 5-10 years.

Any dunes with two or more of these criteria should be considered for priority survey of macrofungi. On this basis 30–60% of sites need survey and it is recommended that a Wales-wide survey similar to that of the CCW-funded project, A Mycological Survey of Selected Semi-natural Grasslands in Wales (Griffith *et al.* 2006), be undertaken.

All sites should be periodically monitored on a regular basis not only for their dune SoCC (tables 3.1 and 3.2) but also for their other dune fungi (table 3.38).

Timing for dune survey and monitoring should always be at the surveyor's discretion/expertise. Tables 3.1, 3.2, and 3.3 give recorded dates for SoCC but in general dunes should be visited throughout the year for macrofungi. Being coastal often with milder winters they can continue to be good for macrofungi fruiting from September into late winter (Jan/Feb) and again during the late spring to early summer (April-July) provided the weather has been wet enough in the preceeding weeks.

4.4 Site Conservation for Dune Fungi

Provision of a preliminary evaluation of sites for dune fungi using the 'S&D' count is a first step to secure protection of all the best sites currently known, particularly those not previously considered to be of conservation value. Such an assessment would also ensure that dunes within SSSIs and other protected sites are managed appropriately for their dune fungi assemblages.

The separation of fungi recorded in dunes into stratified SoCC (i.e. dune fungi, dune fungi only in Wales, and non-dune fungi) allows priority to be given to targeted searches for key dune species, such as those on Section 42 and the dune SoCC list (table 3.1) as well as all non-SoCC dune species (table 3.38) which may with further survey and evaluation also prove to be of conservation concern.

As dunes in Wales are predominantly base-rich they are also a very important habitat in Wales for base-loving SoCC. It is recommended that all these taxa should also be included as a priority in further survey, mointoring and conservation strategies:

Basic grassland – *Entoloma excentricum, Omphalina galericolor, Camarophyllopsis schulzeri, Chamaemyces fracidus, Clavaria incarnata, Cortinarius anomalus, Entoloma bloxamii, E. catalaunicum, E. indutoides, E. roseum, Geoglossum elongatum, Hygrocybe calciphila, H. phaeococcinea,* and *Ramariopsis tenuiramosa*

Basic scrub/woodland – *Limacella delicata, L. guttata, L. illinita,* and *Morchella elata*

Further survey work to gain better data on both the key components of 'dune fungi assemblages' and the distribution of such assemblages in Wales is an essential prerequisite for effective fungal conservation and monitoring.

4.5 Research Priorities for Dune Fungi

Recent research into fungal systematics based on DNA sequencing has revealed surprisingly large numbers of cryptic species, some of which may be geographically or ecologically restricted.

Research at Kew for the 'waxtongue' project has, for example, shown that the *Hygrocybe conica* group (which includes the blackening waxcap *H. conica* and the dune waxcap *H. conicoides*) actually comprises at least seven distinct taxa in the UK, four of which have been found in Welsh dunes (Cannon 2012). The same is true of the persistent waxcap *H. acutoconica* which, according to the waxtongue study, also comprises seven distinct taxa in the UK, at least two of which have been found in dunes. It is clear from this initial study that there are waxcap species in Welsh dunes that are currently unrecognised and either unrecorded or mis-recorded.

Other studies have revealed equally large numbers of cryptic species amongst fungi, particularly in ectomycorrhizal genera such as those associated with *Salix repens.* Large-scale fungal DNA sampling of coastal *S. repens* communities in the Netherlands revealed astonishingly high fungal species figures of between 660 and 971 at different dune sites

(Geml *et al.* 2014). Some of these were familiar, some were believed to be rare or new to the Netherlands, and many were unidentified cryptic species currently unnamed.

It is therefore quite probable that some dune fungi that are now referred to as commonplace taxa will prove to be specialist dune species when investigated further. A possible example is the upright coral *Ramaria stricta*. This is a species that normally grows on well-rotted wood, but also occurs in dunes on dead roots of *Ammophila* (it has been recorded in just such a situation at Morfa Harlech). It could well be that the *Ramaria* on *Ammophila* is a distinct species confined to dunes. Indeed, it has been given the provisional name *Ramaria ammophila* in Scandinavia (Petersen 1999), although no supporting research has been published.
Research combining morphological study and DNA sequencing should be funded and prioritised to study these cryptic dune fungi which are currently overlooked. These species may be rare, they may be endangered – but without further research, they will never feature in any species list or management plan.

4.6 Conservation Priorities

Fungi are essential to the creation and long-term maintenance of dune systems helping to protect the coasts of Wales from flooding. They enable vascular plants to colonize dunes by accreting sand grains allowing pioneering plants to establish and dunes to build.

Dunes support a number of specialist macrofungi that are rarely if ever found elsewhere. Yet only five Welsh dune SSSIs even mention fungi in their notification and then only as a generic ‘assemblage of fungi’ without any indication of the taxa included or of their individual conservation needs. There has been no wide-ranging systematic survey of Welsh dune macrofungi in the last 20 years since the pioneering work of Maurice Rotheroe in the mid 1980s and early 1990s.

Based on the proposed S&D count methodology those dunes ranking equally or above the five that currently cite fungi in the SSSI notification should be regarded as of SSSI merit: Aberffraw, Castlemartin, Crymlyn Burrows, Ogmore Down, Oxwich, Pendine/Laugharne, Pembrey, Morfa Dyffryn, Morfa Harlech, Stackpole, Shell Island and Ynyslas.

The current strategy for conserving the UK’s fungi (Fungus Conservation Forum 2008) stresses the importance of fungi to the health and welfare of the planet and lists as the first target of its first objective the requirement for fungus distribution data not just to be accessible but also regularly updated.

However many dunes have had less than adequate fungus recording with few visits, casual recording, and no recent visits. On this basis 30–60% of sites need surveys and a systematic Wales-wide survey is recommended to fill recording gaps for dune macrofungi. Molecular research into cryptic unrecognised ‘dune‘ taxa which may prove to be of conservation concern is also a priority.

In Wales the equivalent strategy for fungi (Woods 2009) states that to fulfil its statutory duty to further biodiversity conservation it is essential for the Welsh Assembly Government and its public bodies to gain comprehensive species distribution information to inform any environmental assessment process. Key targets include identifying and filling survey gaps

and ensuring the creation of red data and other lists recognising the importance of Welsh fungi.

The lack of a current RDL for macrofungi in Wales and a reliance on a relatively ad hoc list that is nearly 15 years out of date (and produced before most recording networks in Wales were active) are major impediments to conservation progress. The use of the 2003 Welsh Red Data List for this project demonstrates this.

It is likely that fungi in Wales may remain under-recorded for some considerable time compared with other organism groups and in comparison with the remainder of the UK. However since 2003 records for fungi in Wales based on FRDBI have increased by a staggering 50% and given this enhanced dataset of circa 86,000 records, with an estimate (based on additional records for this dune assessment) of a further 15,000–20,000 records held elsewhere, the production of an updated Welsh Red Data List for macrofungi should now be feasible.

And there is most certainly enough data available for a comprehensive and systematic review of Important Fungus Areas in Wales based on all available Welsh records and not just returned questionnaires from a small number of interested field mycologists, as happened in 2001.

A collation of all fungi records for Wales would be a very positive though minimum first step toward producing one or both of these key conservation tools.

Over 14% of the Welsh coastline is comprised of dune systems (a higher percentage than in England) and these, together with upland unimproved grasslands in Wales, give rise to a significant and distinctive element in the mycota. In future with adequate survey Wales may prove to be not only a European stronghold for its waxcap-grassland taxa but also a stronghold for its dune fungi.

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